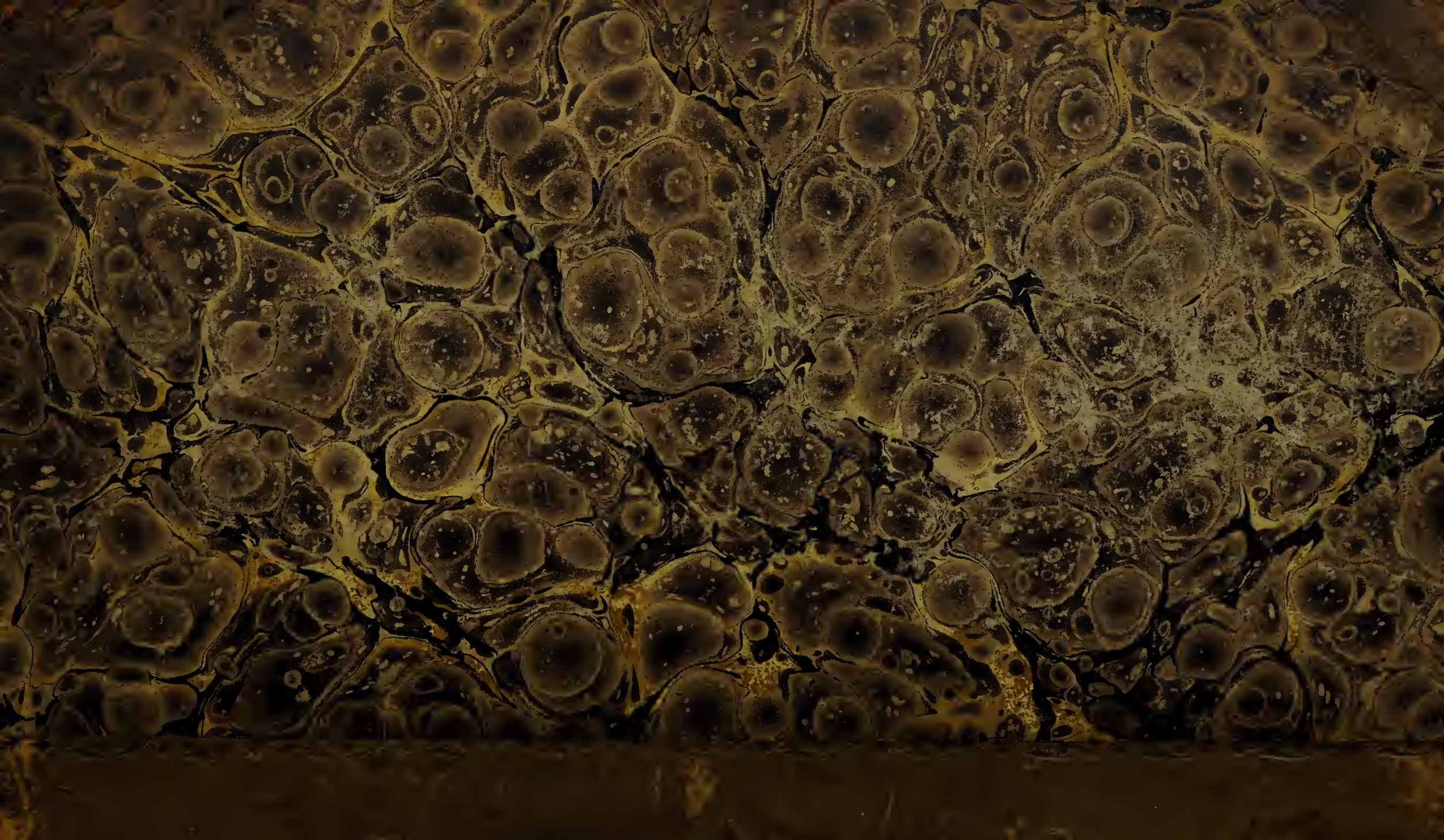

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Engd by J.W

A Perspective View of the

London Mechanics' Institution.

established the 2d of Decr 1823 for the purpose of

ENCREASING THE KNOWLEDGE, REFINING THE TASTE,

& eliciting the Genius of the Artisans of

LONDON.

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51303

REGISTER

OF THE

ARTS AND SCIENCES.

VOLUME THE THIRD.

THE PRESENT VOLUME CONTAINS

A CORRECT ACCOUNT OF SEVERAL HUNDRED OF THE MOST IMPORTANT AND INTERESTING

INVENTIONS, DISCOVERIES,

AND

PROCESSES.

ILLUSTRATED

WITH UPWARDS OF ONE HUNDRED AND SIXTY ENGRAVINGS.

LONDON:

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INDEX.

Acid, newly discovered, by M. Braconot, 6
Africa, notice of travellers therein, 317
Air, compression of in gaseous bodies 270
Alarum, applied to a watch, with engravings, 244
Alum Mine, recently discovered in France, 359
Ants, to prevent the ravages of upon wall-fruit, 62
Anatomical Preparations, preserving of, 95
Anatomy, artificial, by Dr. Auzoux, of Paris, 303
Anti-Attrition, composition of the patent, 158
———— Composition of the German, 207
Arithmometer, 112
Astronomy,—Mr. Wallis's course of six Lectures, delivered at the London Mechanics' Institution.
1st. Form of the earth—its motions—centrifugal force—seasons—day and night, 300
2nd. Time, solar and sidereal.—The moon—her rotation—her phases—her librations—her orbit—her nodes, and the connection of these with the occurence of solar and lunar eclipses.—
3rd. Theory of universal gravitation—this principle applied to the lunar motions—telescopic appearance of the moon a proof of her being surrounded by an atmosphere—general theory of the tides, 331
4th. Composition of forces—rectilinear and curvilinear motion—the latter practically shewn to result from the combination of an equable with an accelerating force.—Planetary motion explained on mechanical principles.—Continuation of the subject of the tides, 349
5th. Refraction and aberration of light—Horizontal magnitude of celestial objects—Parallax—Transit of Venus—Phenomena of the sun, 365
6th. Various astronomical systems.—General view of the solar system—Phenomena of the planets.—Saturn's rings—Eclipses and transits of the satellites of Jupiter.—Comets.—Fixed stars—Nebulæ—Conclusion, 381
Astronomical tables, by M. Schumacher, 318
Atmosphere, variations in the composition of, 222
Automato, extraordinary, 143
Axletrees and bearings, Stevenson's patent, with engravings, 309

Balloon, water travelling, 61
Balance beams, Patten's, with engraving, 24
Bark, extract of, improved, 78
Bandana handkerchiefs; the process employed in the Great Bandana Gallery, in the Turkey-Red Factory of Messrs. Monteith & Co., at Glasgow, 185
Barometers improved, 143
Barley and Groats, Robinson's patent process in preparing, 151
Bevil, universal, by M. Alard with engraving, 108
Bisecting guage, Palmer's, with engraving, 326
Bister, French process of making, 334
Blow-pipe, experiments with, 14
Blood, curious observations on the circulation of, 15
———Case of a woman's life saved by the transfusion of
Bleaching liquid easily prepared, 175
Boiling point of fluids accelerated, 31
Boats, Gordon's patent steam, with engravings, 33
——— life, Dickenson's patent air chambers for, 36
——— steam, to prevent their running foul of each other, with engraving, 152
Bottling apparatus, Masterman's patent, with engraving, 65
——— ditto, with engraving, 376
Bricks, Burridge's patent ventilating 23
Brick making machinery, Leahy's patent, with engravings, 81

Brick making machinery, Leahy's patent, with engravings, 105
——— Rhodes's patent for improved clamps, 105
Bridge, Cundy's counterbalance crane suspension, with engraving, 145
——— over the Menai, 255
Bronze, to make, 159
Brown bread, superior wholesomeness of, 14
Butter at Aleppo, 144

Casks, Mr. Dickenson's patent metal, with engraving, 19
Capstan, Mr. Hawkes's patent, with engraving, 17
——— observations upon, 39
Camera lucida, modification of, by Amici, 29
Canals, number and extent of, in Britain, 48
——— proposed, for ships, from London to Portsmouth, 146
——— digging machine, 371
Candles, burn best in an inclined position, 78
——— Gay Lussac's patent, 274
Cannon founding, improved alloy for, 190
Caustic employed to destroy the variolous eruption, 95
Casts, metallic, from engravings on copper, 79
Cashmere, British, Schofield's patent, 135
Cat-block, newly-invented, 119
Carriages, loco-motive, &c. Snowden's patent, with engravings, 194
Castor oil plant, method of obtaining the oil, 223
Cement, Roman, 63
Chimnies, method of curing smoky, 207
——— proper proportions of by Mr. Tredgold, 93
——— Hiort's patent, 307
Claret, annual produce of, 272
Coals, Christie and Harper's patent for mixing, 55
Coal-mines in France, 369
Cobalt blue, process of manufacturing, 203
Cocks, Ridgway's patent porcelain, with engraving, 267
——— new construction of, with engraving, 360
Coffee urn, Evans's improved, with engraving, 106
Compass, mariner's, notice of Capt. Phillips's improved, 320: description of, with engravings, 344
Copper-white (the Pakfong of the Chinese), formula for the preparation of a close imitation of, 29
——— in ingots, obtained via humida, 30
———bottoms of ships, Sir H. Davy's recent observations on, 318
Copying machine of a simple kind, with engraving, 40
Cordage, Hancock's patent, 68
Corn, mildewed, apparatus for speedily drying, with engraving, 73
Corking bottles, Masterman's patent machine for, with engraving, 130
Ditto ditto improved, 377
Crane, new modification of, with engraving, 133
Crickets and beetles, to destroy, 63

Damp walls, cure for, 63
Diamond, Brazilian, 14
Distillation, Professor Oersted's rapid method of, 13
——— Saintmarc's patent apparatus and process for preparing brandy from potatoes, with engravings, 25, 41
——— new form of apparatus and process, with engraving, 321
——— Grimble's patent apparatus, in use at Messrs. Booths' distillery, with engravings
Diving-bell, notice of Mr. Steele's new patent, 196
Diving apparatus, James's patent, with engravings, 242
Dog, the, an original inhabitant of the new world, 159
Dough, machine for accelerating the fermentation of, 39
Dropsy, infallible remedy for, 142
Dry rot, prevention of, 182
Drawings, mode of imitating oil painting with water colours, 63
Dynamometer, Palmer's improved, with engravings, 289

Earthquakes sensibly felt at 3000 miles distance, 189
Earth, Capt. Symes's theory of its being hollow, 221
Engravings, French, 329
Elaine, or "watch-makers' oil," process for obtaining, 7
Etching and cleaning of alabaster, 334
Evaporating apparatus, Perkins's patent, with engravings, 103
——— on a new plan, with engraving, 321
Excavation; Matthews's improved mode of barrowing out earth, with engraving, 293

Eye, insensibility of the retina, 47

Fish, on the transportation of, from salt to fresh water, 205
——, flying, in the channel, 334
Fishing birds of China, 363
Filtering in closed vessels, Mr. Donovan's apparatus for, with engraving, 305
——— apparatus, Suwerkrop's patent, with engravings, 305
Fire extinguishing engines, on uniting the power of several, with engraving, 219
——————— observations on the foregoing, 265
——————— machinery, Dodd's patent, with engravings, 294
—— escape, Richman's patent, 59
———— portable, with engraving, 357
—— proof, new method of rendering wood so, 190
Fleas, remarkable swarming of, 28
Fluids, the principles of the heating and cooling of, demonstrated with engraving, 139
Fruit, how to preserve green, 47
Freezing mixture, 271
Fuel, Sunderland's Patent for, 133
Furnace, White and Sowerby's patent air, 71

Gas and steam engines, Hall's patent, with engravings, 49
— engine, Brunel's patent new motive power from carbonic acid gas, with engravings, 258
— engine, Mr. Cheverton's new power engine, with engraving, 326
—, Taylor's patent apparatus for generating, with engraving, 137
—, Hobbins's patent apparatus for obtaining, with engraving, 153
— apparatus, Vere and Crane's patent, with engravings, 177
—, portable, the process employed at the portable gas works for compressing the gas in the portable lamps, with engravings 161
— condensing pumps, Mr. Gordon's note upon, 182
— tubes, Whitehouse's patent process in making, 150
Gelatin tanned, artificial horn produced thereby, 129
Georama, at Paris, 14
Geography, American, 95
Glass for optical instruments, 94
Glasses for lamps, to prevent their bursting, 97
Glazing, new, for earthenware, 336
Glaze for porcelain improved, Rose's process, 181
Glue, Yardley's patent apparatus and process of manufacturing from bones, with engraving, 313
Gold, formula for the imitation of, 111
Green colour, from cobalt and zinc, 15
Groats and barley, Robinson's patent process in preparing, 151
Gymnastic exercises, 320
——— Society, 3

Hats, Gibson's patent, 22
Heating water and other fluids, Suwerkrop's patent apparatus, with engravings, 305
Hinges, Whitechurch's patent, with engravings, 97
Hot-pressing, by heated air, with engraving, 225
————, by steam, Lord's patent, 308
Horn artificial, mode of preparing, 29
Horse-labour, Mr. Tredgold's table of calculations upon, 319
Hydrogen gas, effects produced by inspiration, 223
Hydrogen, bicarburet of, 127
Hydrophobia, prevention of, 15
Hydraulic machine, Schwœbel's, 62
——————— Mortala's, 93

Identigraphy, 61
Ink, inquiry on the mode of restoring the black colour, 45
Ink-stand, Edwards's new patent, with engraving, 120
Insured property, amount of in England, 143
Inquiries in the useful arts, 95, 160, 175, 239, 256
Insects, recipe for driving from trees, 334
Iron, slow oxidation of, in high regions, 32
—— Preservative against rust, 207
—— Bars, to convert partially into steel, 110
—— Horton's patent process in manufacturing, 146
—— Indian method of twisting for gun barrels and sword blades, 298
—— Luckcock's patent process of manufacturing iron, 340
Isinglass, mode of preparing, 292
Island, newly discovered in the Pacific, 317

Kelp, process of making in Scotland, 11

Kettle, Gordon's improved, with engraving, 248

Labour, quantity requisite, if equally divided, 304
Lacker, mode of preparing the various tints of, 30
Land, on the recovery of from the sea, 310
Lamp glasses, 99
——— , Honourable E. Cochrane's patent dissolvent, with engraving, 135
——— and Lanterns, Crossley's patent for, 158
——— , portable, process adopted at the London portable gas works for filling the lamps, with engraving, 161
——— , Gordon's patent spirit and naptha lamps, with engraving, 249
——— For burning fat, 255
Launch, Cow's improved ship's launch, with engravings, 296
Leghorn plait, process of plaiting, 124
Lead, Chinese mode of casting the thin sheet, 127
Leaden pipes, experiments to prove the strength of, 206
Leather, Hancock's patent substitute for, 22
Lever, Burnet's patent, for a new rotatory or endless lever action, with engravings, 86
——— Do.—Do. claim of invention disputed, 118—answer thereto, 153
Life boats, Dickenson's patent. 36
Life preservers, Bell's, 61
Light and heat, Mr. Baden Powel's experiments on, 92
Light produced during the chrystallization of benzoic acid, 143
Light-houses, improvements in, 208

Magnetizing power of the violet rays of light, 269
Manure, the muriate of lime, a valuable, 12
Mangle, cheap, with engraving, 40
Mechanical power, new application of, 175
——————— From the expansion of liquified gases, 247
Mechanic's Institutiont London, Dr, Birkbeck's observations on Mr. Dyer's improvemens upon the action of the wheel and pinion, 27
Mechanic's Institution, Southwark 349
Melting pots, Anstey's improved. with engravings, 281
Meridian, one universal proposed, 279
Meteoric Stone, 239
Metropolis, improvements in, 363
Microscopes improved, 359
Mines discovered in N. America, 189
Mining pump, 1000 feet long, 62
Model of England, 158
Monument to Sir Hugh Middleton, proposed, 357
Moth Gigantic, 271
Multiplication, short mode of, 192
Mummies, Egyptian, mode of preparing, 30

Navigation, inland, Capt. S Brown's patent for propelling vessels, 219
Nuts, hazel, found in a singular state, 271
Nutcracks, easily made, 79

Oil, rancid, easily made sweet, 78
— of Teak, valuable uses of, 110
— Castor, mode of obtaining from the plant, 223
Oven, economical for baking bread, 280

Pavement, Mr. Chamber's patent, with engraving, 4
Pantochronometer, 239
Painting in milk, 333
Paintings, French, notice of sale, 320
Paper, incombustible, 63
——— made from straw, Lambert's new patent, 76
——— Steart's process for making the lino-stereo paper tables, 173
——— Nesbitt's patent process of making paper from moss, 174
Pectic acid, 6
Paper, method of improving for draughtsmen's use, 183
Patents, lists of new, 16, 32, 64, 80, 96, 112, 128, 144, 176, 208, 224, 240, 256, 272, 288, 304, 368
Patents expired, list of, 368
Pencils, process of making hard black lead pencils for artists, 183
Penknives, improved, 31
Pearl shell work, Jenning and Betteridge's patent process, 180
Pistons, Bartons' patent metallic, with engraving, 169
——— Perkins's patent ditto, 170
——— Jessop's patent ditto, 184
Pigment, permanent vegetable green, 271
Pipes, earthen, Bagshaw's patent, 346
Piano-forte with violin tones, Todd's patent for, with engraving, 56
Plants, action of animal poisons upon, 94

Plants, on the sleep of, 63
Plants, poisonous indications of, 62
Plane for hard wood, with engravings, 277
Platina, formula for the imitation of, 111
Plough, Moravian, to make three furrows at a time, 93
Potatoes, cultivation of, for obtaining potash, 23
——— preparation of paint from, 92
——— phosphorescence of, 92
——— grown in the dark, 223
Porter, origin of the term for this beverage, 159
Pounding with pestle and mortar, expeditious method, with engraving, 121
Poppy, white, cultivation of, for obtaining British opium, 358
Printing, extent of, at Paris, 124
Pumping, effective apparatus for, with engraving, 5
Pump, extraordinary, for the Mexican mines, 62
Pumps, syphon, for compressing gas, with engraving, 273
Pyrometer, Mr. Gurney's new, with engraving, 8
Pyrophorus, new, from tartrate of lead, 61

Quack medicines, the composition of twenty, 286
Quills, improved mode of preparing, 14

Railway and carriages, Palmer's patent, Mr. Tredgold's observations on, 142
——— Fisher's patent, with engravings, 268
Rail-roads, new material for, 227
Raft for transporting timber, Harrington's patent, 307
Razors, a paste for sharpening them, 92
Rectification, new process adopted in France, 157
Rhubarb, process for preparing the sulphate of, 13
Rivers, navigation of, against the stream, 314
Road-making, Mr. Mc'Adam's plan, 15
Roads, Roman, Mr. Tredgold's account of, 128
——— American, great, 191
——— Parker's patent paved roads, 345
Ruler, for drawing radii, with engraving, 109

Saddles, Mr. Marsh's patent, 13
Safety hood, Roberts's patent, 191
——— Do. with engravings, 230
Saline liquid, apparatus for the concentration of, with engravings, 339
Salads, should be washed in salt water, 271
Saw-mills, enquiry upon, 55
Sculpture, statue of Eve, 320
Scientific periodical, proposal for a new work, 45
Sea-horse, killed in Orkney, 95
Sea-sickness, contrivance to prevent, 126
Shot; Manton's patent improved lead shot, 479
Silvering of buttons, French process, 359
Silk-throwing machinery, 47
Smoke, Jeffery's patent mode of condensing, with engraving, 104
Soap, transparent, easy method of making, 127
Sound, transmission of, 334
Society Islands, sugar and cotton manufactures there, 95
Solar spots, observations npon the motion of, 47, 318
Spray of the Sea blown 30 miles distance, 15
Stature, increase of at rising, 79
Stereotype, Senefelder's new method, 272
Steel; Thomson's patent process for making refined cast steel, 38
——— Needham's patent process for casting steel, 53
Sting of a wasp, cure for, 93
Stove, new invented smoke consuming, with engraving, 102
——— design for a smoke consuming, with engraving (inserted by an over-sight), 119
——— smoke consuming, with engraving, 168
Stoves and grates, Atkins and Marriott's patent, with engravings, 209, 230
——— Jacomb's patent, with engravings, 353
——— air; Perkins's improved mode of warming and ventilating large buildings, with engravings, 341
Stone, artificial, Wilson's process for making, 171
——— Tulloch's patent machinery for sawing, with engraving, 361
Stumps of trees, method of clearing ground therefrom in America, with engraving, 311
Stucco, ligneous, the composition and process, 287

Steam Engine, history of, from its first invention down to the present time; with *original drawings*:—Introduction 234—The properties of steam discovered by accident, 235—Hero the elder, 235—De Caus's engine, with engraving, 236—Branca's engine, with engraving, 237—Marquis of Worcester's engine, with engraving, 238—Dr. Papin's experiments; invention of the safety-valve 251—Captain Savery's engine, with engraving, 252—Dr. Papin's improved engine, with engraving, 254—Newcomen's experiments, 266: his engine, with engraving, 267 — Leapold's high pressure, with engraving, 284; advantages of high pressure engines, 285—Hulls's improved engine, 347—Blakey's engine, with engraving, 348—Fitzgerald's substitute for the crank, with engraving, 349—Watt's experiments and discoveries, 363 — Gainsborough's claims to Watt's discoveries.—Cylinder of Watt's engine—Sun and planet motion—Parallel motion — Governor — Condenser—Addition of the crank, and substitution of the sun and planet motion—all these successive improvements are exhibited together in the engraving of one engine.
Steam engines at Glasgow, 15
——— and gas engine, Hall's patent, with engravings, 49
——— engine, Eve's patent, 158
——— engine, Capt. Foreman's patent, with engravings, 217
——— engine, Taylor and Martineau's new patent, 261
——— engine boiler, Mr. Evans's new application of the waste steam, with engraving, 1
——— Mr. Gilman's letter on the decomposition and combustion of, 42
Mr. Nevill's letter on the same subject, 44
Steam boilers, Paul's patent, 69
——— improvements in the generation of, by Mr. Bellingham, 84
——— Dr. Alban's patent steam generators, 114
——————— letter on the subject, with engravings, 245
——— engine boilers, Maudsley and Field's patent, 132
Steam, Wadsworth's steam generators, 158
——— engine boilers, Moore's patent, 223
——————— Thompson and Burr's patent, 233
——— generating apparatus, with engraving, 339
——— boats, Gordon's patent, with engravings, 33
——————— American, 61
——————— novel construction of, with engravings, 291
——— packet, the Enterprise, arrival at the Cape of Good Hope,
——— mode of generating by burning glasses, 38
——— stoves and grates, 2, Do. with engraving, 53
——— stove, American, 86
Sugar, to detect the adulteration of, 47
——— from the beat root, 311
Sulphuric acid, anhydrous concrete, 94
Swallows, use of in destroying Caterpillars, 14
Tallow tree (Piney of India), by Dr. Babington, 76
Tanning in cold weather, how effected, 127
——— Spilsbury's patent mode by mechanical pressure, 200
Tablets, lino-stereo, Steart's process in making, 172
Telescope, enormous, by Strayel, 93
——— Ramage's large reflecting, 233
Temperature, extremes of, 271
Thrashing machine, 3
Tide, in the Mediterranean, remarks upon, 14
Tinning of iron and copper vessels, the process, 175
Tortoiseshell work, French and German process, 190
Toad, ascertained to be poisonous, 272
Tree, the American devil's, remarkable fruit of, 95
Tree, yew, 1150 years old, 223
Trees of New Zealand, very large, 224
Trinkets, gold, easy method of improving, 159
Turning, eccentric circular, Ibbetson's improvements in, with engravings, 57
Tunnel under the Thames, 297

Udometer, improved, to shew quantity of rain, 142
Ultramarine, the process of preparing, 159

Varnish, seed lac, process for making, 30
——— French, for furniture, preparation and use, 78
Valves, Gordon's patent, for portable gas lamps, with engravings, 165
Valves, safety, for steam boilers, with engraving, 278
Vegetation, effects of earthquakes upon, 13
Ventilation, Vallance's patent, with engraving, 196
Verdigris, new apparatus for preparing, 339
Vinegar, Ham's patent process, 219
——— Process for acidifying vinegar, 340
Voyage of discovery, by Capt. Beechy, 15
——— by Capt. Durville, 336

Washington, monument to the memory of, 191
Walrus, taken at Orkney, 288
Water works at Primrose-hill, 61
Water-closet, Beacham's patent, with engraving, 125
Water pipes, Magrath's patent, 135
Water-engine, Cabanal's patent engine for raising water, with engraving, 338
Waterproof cloth and silk, French process in making, 92
Watchmaking, trade at Paris, 143
Wedge, Mr, Griffiths's expanding, with engraving, 276
Weaving machine extraordinary, at Lyons, 175
——— Mr. Augustin Corant's, of Lyons, 220
Weighing of ships and cargoes, machine for, 299
Weighing machine, Hawkins's patent hydraulic, with engraving, 72
Wheelways, Snowden's patent wheelways and carriages, with engravings, 194
——— ditto, remarks upon, 229
Winds prevalent, 272
Wood, Atlee's patent process in condensing, 100
Writing, to revive faded, 63

Yew tree, wonderful age of, 223

ERRATA.

Page	12,	line 25,	for M. Dubuee, read M. Dubuc.
....	30,	 25,	.... arnatto, read annotto.
....	34,	 3,	.... (see page), read (see page 39).
....	39,	 7,	.... arrangement, read arrangements.
....	47,	 44,	.... Majindie, read Majendie.
....	70,	 44,	.... cupola's read cupolas.
....	94,	 6,	.... an hydrous, read anhydrous.
....	101,	 37,	.... some pieces, read a piece.
....	111,	 34,	.... following of, read following formula for.
....	118,	 41,	to line 32 page 119, the whole inserted by mistake.
....	125,	 28,	.... possessed, read possesses.
....	141,	 28,	.... several o, read several of.
....	141,	 29,	.... an, read and.
....	154,	 8,	.... an, read a.
....	167,	 36,	.... which approximates, read approximating.
....	219,	 41,	.... the mode, read this mode.
....	223,	 11,	.... then were, read these were.
....	234,	 41,	.... watery vast, read watery waste.
....	238,	 6,	.... *enigma* read enigma.
....	251,	 24,	.... condensed, read compressed.
....	252,	 16,	.... shown, read shewn.
....	267,	 19,	.... jit, read jet.
....	268,	 28,	.... on an inch in a given area, read on an inch; in a given area.
....	268,	 43,	.... discerned, read discovered.
....	268,	 51,	.... *scag*, read *scog*.
....	....	 53,	.... *scagger*, read *scogger*.
....	284,	 15,	.... fourway cock x, read fourway cock.
....	284,	 16,	.... fitted, read filled.
....	285,	 17,	.... raised it into, read raised it, into.
....	347,	 20,	.... must, read might.

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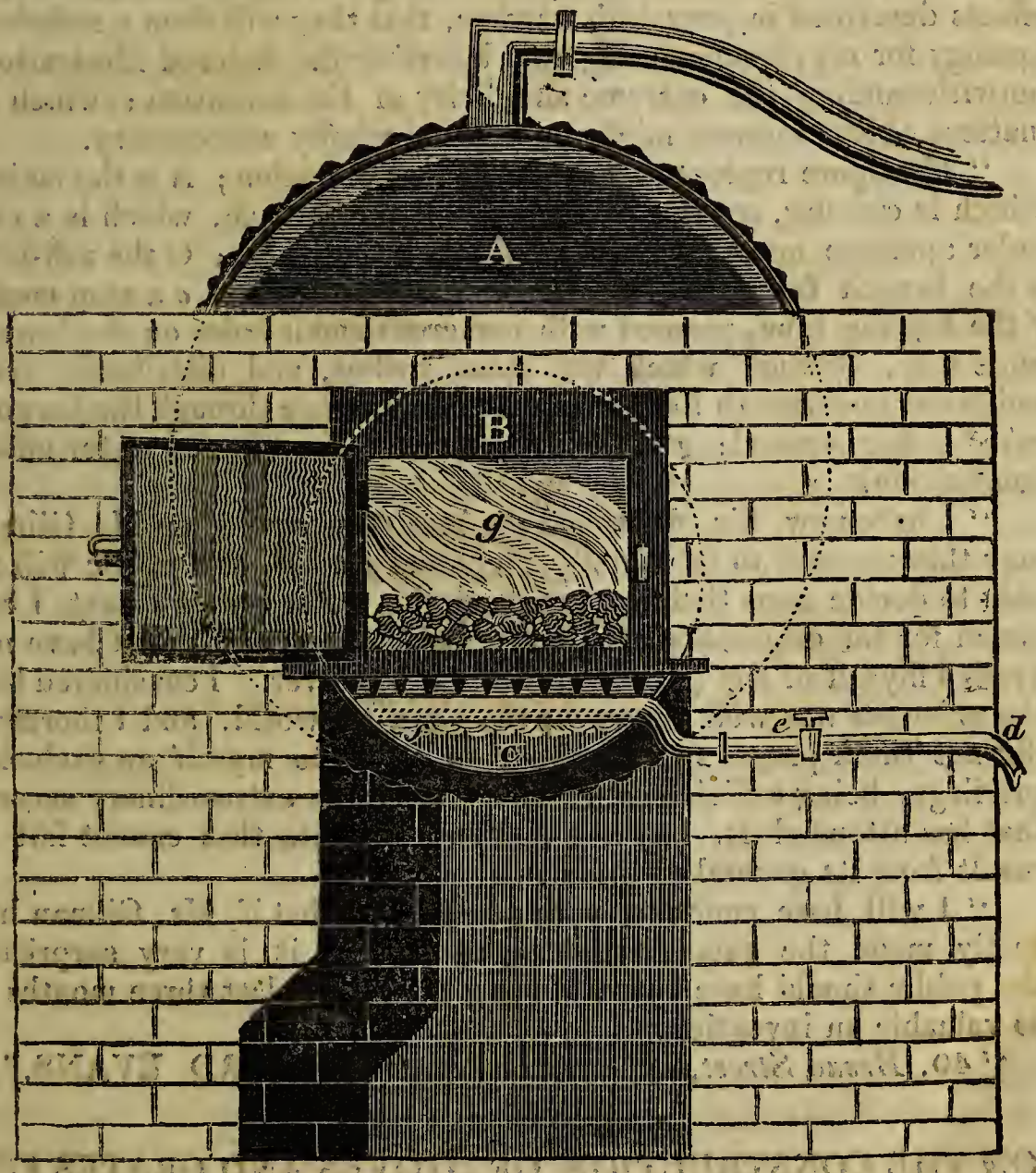
CONTENTS:

Mr. Evans's New Application of Steam, - 1
On the Construction of Stoves and Grates for the Combustion of Steam, - - - - 2
Chambers's patent Pavement, - - - - - 4
Effective Method of Pumping, - - - - - 5
Account of the newly-discovered and valuable Acid, by M. Bracconot, - - - - - 6
Process for obtaining Elaine or pure Oil, - 7
Gurney's Improved Pyrometer, - - - - - 8
Dickenson's Patent Metal Casks, - - - - 9
Process of Manufacturing Kelp, - - - - 11
Miscellaneous. Muriate of Lime, a valuable Manure, 12,—New mode of rapid Distillation, 13,—Marsh's patent Saddles, ib.—Effects of Earthquakes on Vegetation, ib.—Carpenter's Formula for the Preparation of the Sulphate of Rhubarb, ib.—New and superior process for the Preparation of Quills, 14,—Georama, ib. Diamond, ib.—Blow-pipe Experiments, ib.—Brown Bread, ib.—Destruction of Caterpillars ib.—Observations of the Tide in the Mediterranean, 15,—Cure for Hydrophobia, ib.—Circulation of the Blood, ib.—New Green Colour, ib. Steam Engines, ib.—Spray of the Sea, ib.—Voyage of Discovery, ib.—Art of Road-making, ib.—Patents, Correspondence, &c. 16.



MR. EVANS's NEW APPLICATION OF STEAM.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"Sir,

"It appears by your last number, as well as by a note which I have received from a Mr. Gilman, that the priority of my invention, in the new application of steam, is not only disputed,

but claimed by that gentleman, under a patent dated the 13th April last, for 'certain improvements in generating steam,' which improvements not having yet been specified, every new and valuable invention for the same purpose may in like manner be claimed under such vague, general, and undefined terms.

"That justice may however be done between the public and Mr. Gilman, I am ready to afford proofs of what *I* have effected, and with that view I send you a sketch of the method by which I cause the decomposition of the steam and the combustion of its hydrogen; and I further hope that by so doing I shall likewise induce Mr. Gilman to bring forward something like proof of his having done the same thing, and at a prior date.

"The advantages attending this mode of employing steam are so important, exceeding indeed my most sanguine expectations, and the effects described in your 46th number, that they will form a sufficient apology for my recommending your inserting the inclosed illustration, notwithstanding the extreme simplicity of the invention; which in matters of less interest might be deemed wholly unnecessary.

"The figure represents a front view or elevation; A is the boiler, which is circular, set in brick-work. B the furnace, which is a circular aperture made horizontally through the boiler; C the ash-pit; *d* the branch from the waste pipe of steam engine; *e* a stop cock; *f* the feeding tube, pierced with numerous small holes on the lowermost side, through which the steam rushes, and distributes itself uniformly underneath the bars, and in its passage through the burning coke, is decomposed; *g* the hydrogen of the decomposed water under combustion.

"I have now, Sir, described *my* invention, and when Mr. Gilman may think proper to be equally plain and candid, the public will be able to decide upon their respective merits. For my own part, I can vouch for the originality of my own application, and that I have not availed myself of any person's invention whatever. I considered that the *principle* was well known to the chemical world, and I therefore did not think proper to endeavour to secure to myself an exclusive privilege, being sufficiently gratified with the extraordinary success that has attended it, and the immense benefits that cannot fail to result from its general adoption.

"I will here conclude with remarking, that if Mr. Gilman had really made the same discovery as myself, it is very surprising the public should have heard nothing during the last three months of so valuable an invention.

"40, *Bread Street*, "RICHARD EVANS."

ON THE CONSTRUCTION OF STOVES AND GRATES FOR THE COMBUSTION OF STEAM.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"THE interesting discovery of steam being a supporter of combustion, and the successful application of it by Mr. Evans, as described in your 46th Number (page 342) must necessarily lead

to a great change in the construction of our common domestic stoves and grates. I have lately made the experiment of placing a pan of water under the grate bars, and find the fire materially increased by it as soon as it begins to be drawn off in steam. My fire was lighted in the usual way; by the time that the fresh coals had ceased to blaze, the water had become hot, and a fine bright red flame arose from among the burning cinders in the lower part of the grate, which was clearly the combustion of the hydrogen of the decomposed steam. I have been unable to make any progress in the matter, owing to my regular avocations and the heat of the weather; and my only motive in writing to you is to draw the attention of stove-makers generally to the subject, that their ingenuity may be exercised in the construction of the most convenient apparatus, for effecting so considerable a point of economy.*

The mode adopted by Mr. Evans may easily be applied to all grates containing boilers, from which it will be only necessary to carry a steam pipe under the bars, with a stop cock in a convenient situation to turn it off or on. In the common stoves for parlours and other rooms, there are many obvious methods of applying the principle. Those stoves having a false bottom may instantly be supplied with his new liquid fuel; by sliding in between the true and false bottom, a pan containing either water, or some incombustible material that will readily absorb it, such as sand for instance; but what strikes me as more desirable is pumice stone, which being a very hard as well as a very porous body might be neatly fitted, like a pavement, in a shallow vessel; being then exposed to the heat the water would be quickly evaporated from the surface, and it would be easy to arrange a method of supplying it with small quantities of fresh water. In register stoves there are so many convenient situations for a boiler, that the difficulty is only to decide upon the best. In pedestal and other kinds of stoves that are placed in the middle of an apartment, with a pipe to convey off the smoke, the adaptions may be as various as they are obvious, the application in itself being so exceedingly simple. A common tea-kettle might have a screwed nozzle instead of the common shaped spout, to which a flexible pipe or hose, might be affixed whenever desirable, (in the same manner as in fire engines) for the conveyance of the steam under the grate.

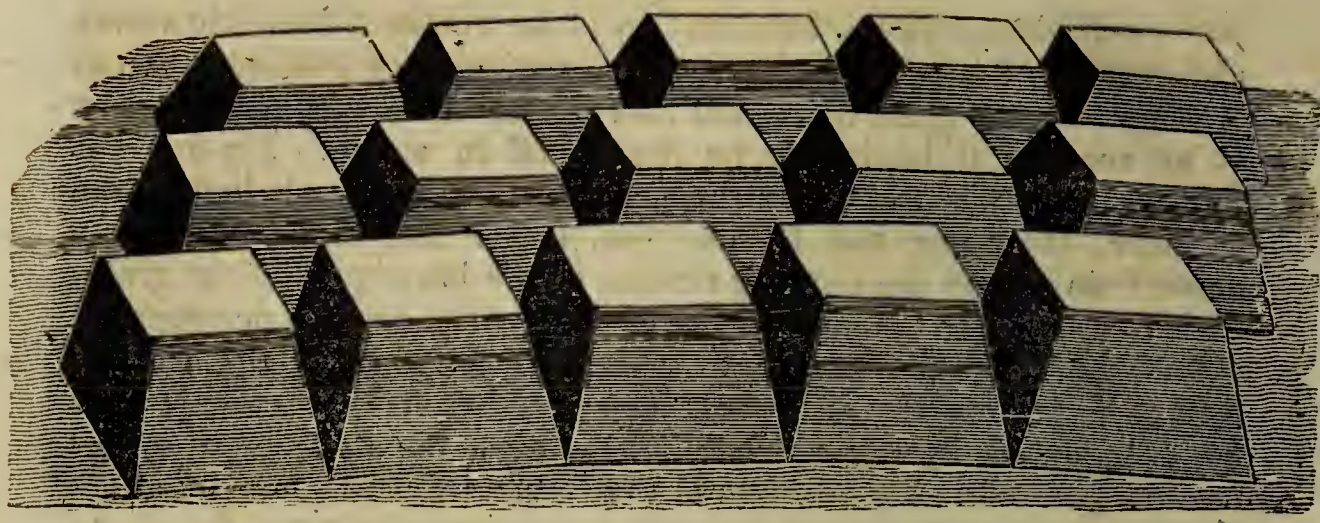
"If it shall be found that coke may be advantageously employed in our common stoves instead of coal, of which there is little reason to doubt, then, indeed, the discovery will be justly deemed of transcendent value and importance, and the public will stand highly indebted to Mr. Evans for his unreserved communications; that greatest of nuisances in all large towns, smoke, will be entirely got rid of, and the health of the population be thereby materially promoted.

"Hoping to see ere long, in your excellent work, some designs for the accomplishment of this great good,

"I remain, Your's, &c.

"*June* 24, 1825. "A CONSTANT READER."

* Mr. Evans finds the saving of fuel to be nearly fifty per cent.—Ed.



CHAMBER'S PATENT PAVEMENT.

This is a patented invention of Mr. Abraham H. Chambers, of New Bond Street, and it appears to be a very decided improvement upon the ordinary method of paving the horse and carriage ways of our public streets.

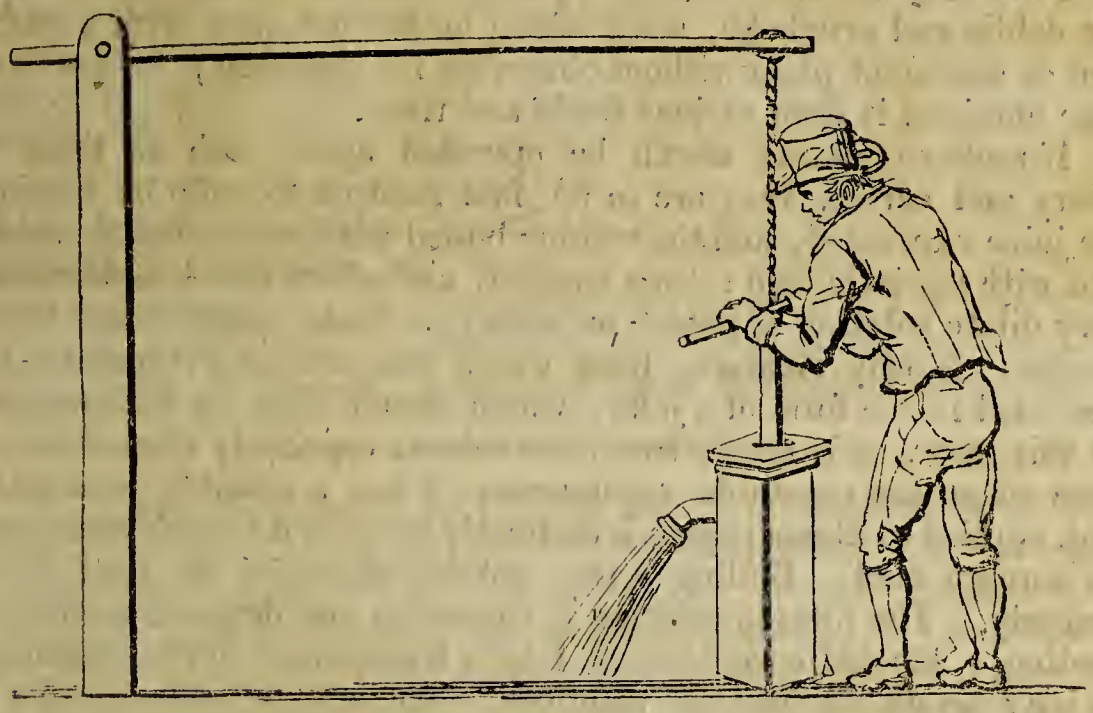
It is proposed to form the bed of earth or gravel of the usual figure, which is a slightly elevated arch; this foundation is to be rendered as firm and solid as possible, by ramming, previous to laying down the stones, which are in form like the lower portion of a regular quadrangular pyramid, and are arranged so that the sides of each stone shall overlap those in the next row, as exhibited in perspective in the above cut. When they are thus laid uniformly and evenly with their broadest surfaces or bases downward, a quantity of some of those stone-like cements, of which lime is the basis, or the British puzzolana, is to be poured between the joints, filling them to about one third of their depth; when this has become hard so as to cement the whole into one solid body, the remaining two thirds of the interstices, are to be filled with broken flints, granite, or other hard materials.

On each side of this road way are to be constructed deep brick-gutters for the reception of the water, and the small portion of mud that may be formed: and midway, between each side and the centre of the road, lateral trenches are to be dug, to lead, by an oblique descent, into the brick gutters; these trenches are to be filled with broken bricks and stones, and serve as a filter to convey nothing but the water from the middle of the road into the gutters.

The patentee considers that a paved carriage way constructed upon this plan will be extremely durable, and that it will be kept free from mud or sludge.

Excellent as this road-way certainly is, it cannot withstand the grinding effects of the absurdly constructed wheels of our carts and waggons. Were the road to be made of one solid adamant, it would infallibly be ground to powder by our conical or "dished" wheels. However clearly this may be demonstrated mathematically, it is perfectly unnecessary, as we actually see the pulverizing effect produced upon every stone as the wheel of a laden carriage passes over it. It must nevertheless be admitted, that by Mr. Chambers's new

mode of paving, a road must last ten times as long (even under the grinding system) as one of the ordinary construction, which has no stability whatever.*



EFFECTIVE METHOD OF PUMPING.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"I RECENTLY saw in an old German book, printed not less than 150 years ago, a man pumping water out of a well for the supply of cattle. Not understanding the language of the book I was obliged to content myself with the graphic illustration of the subject, which, from its simplicity, apparently requires but little explanation. Notwithstanding the numerous inventions of late years for the same purpose, I am disposed to question whether there have been any, worked by *manual* labour, that surpass or even vie with this "*old original*" in effectiveness. The spring bar, by the vibration of which the pump rod is raised and depressed, consists of a rough hewn pole inserted into the stump of a tree; but being but a poor artist, I have, as well as I could, made a carpenter's drawing of the thing, and send it you to fill up a corner of the Register, should you think it worthy of insertion.

"*Joiners' Street, Borough,* "JACK BEVIL."
"25 *June,* 1825.

* A foreigner not being able to account for our Chinese-like obstinacy in resisting the adoption of so evident an improvement as the cylindrical wheels to carriages, inquired, whether our leading parliament men were not large owners of stone quarries.

A NEWLY DISCOVERED ACID,

Of very extraordinary properties, which is universally diffused throughout Vegetables, by M. Bracconot.

This acid was first noticed by M. Bracconot in the tubercles of the dahlia and artichoke, since which he has not met with a single root or succulent plant without observing its presence; he has likewise obtained it from various fruits and trees.

If roots containing starch be operated upon, such as those of celery and carrot, they are to be first reduced to pulp by rasping, the juice expressed, and the residue boiled with water slightly acidified with muriatic acid; then washed, and afterwards heated with a very dilute solution of potash or soda; a thick mucilaginous liquid results, slightly alkaline, from which muriatic acid separates the new acid in the form of a jelly, which should then be well washed. In this state, it is nearly free from colour, especially when obtained from colourless vegetable substances; it has a sensibly acid taste, and, applied to litmas paper, it distinctly reddens it though containing no foreign acid. Boiling water quickly dissolves it, cold water scarcely. The filtered solution is colourless and deposits nothing in cooling. Alcohol coagulates it into a transparent jelly, colourless as ice; as do all metallic solutions. The acid is held so feebly in solution by water, that a very little sugar is sufficient to make the greatest part of the liquor coagulate.

With potash it forms a very soluble salt, which may be obtained in the state of transparent jelly, by adding weak alcohol, which removes the excess of alkali, and colouring matter if there be any. This jelly, washed in a cloth with alcoholized water, pressed and dried, is a neutral combination which swells and dissolves in water, and leaves upon evaporation of the liquid a transparent mass full of cracks, and resembling in appearance gum-arabic.

The aqueous solution of this salt is gelatinized by alcohol, sugar, muriate of soda, acetate of potash, and other neutral salts, all earthy and metallic salts decompose it by double affinity. The acids unite to the alkali, and separates the acid as a jelly. What is very remarkable in this salt is the extremely small portions which can communicate the property of gelatinizing a large quantity of sugared water.

M. Bracconot dissolved one part of this salt obtained from the root of the turnip in a certain quantity of warm water; sugar was then dissolved in the liquor, and finally a very small quantity of acid added; in an instant the whole became a trembling mass of jelly, weighing three-hundred parts. In this way he prepared a variety of aromatic jellies, perfectly transparent and colourless, and very agreeable to the taste and sight; and by colouring rose-water with a little cochineal, he made the jelly of roses, of an exquisite flavour.

The same acid added to a weak solution of ammonia, forms also a soluble compound, which, evaporated to dryness, leaves a neutral insipid salt, something like gum, which separates from the evaporating dish in large plates, like mica. Its aqueous solution coagulates

with different substances in the same manner as the preceding. One part of this combination was dissolved in 100 parts of water; alcohol being added, it separated a transparent jelly, which being drained in a cloth, weighed 110 parts. This salt will therefore answer like the preceding in the preparation of jellies, and be more advantageous, as it can be easily obtained in the neutral state.

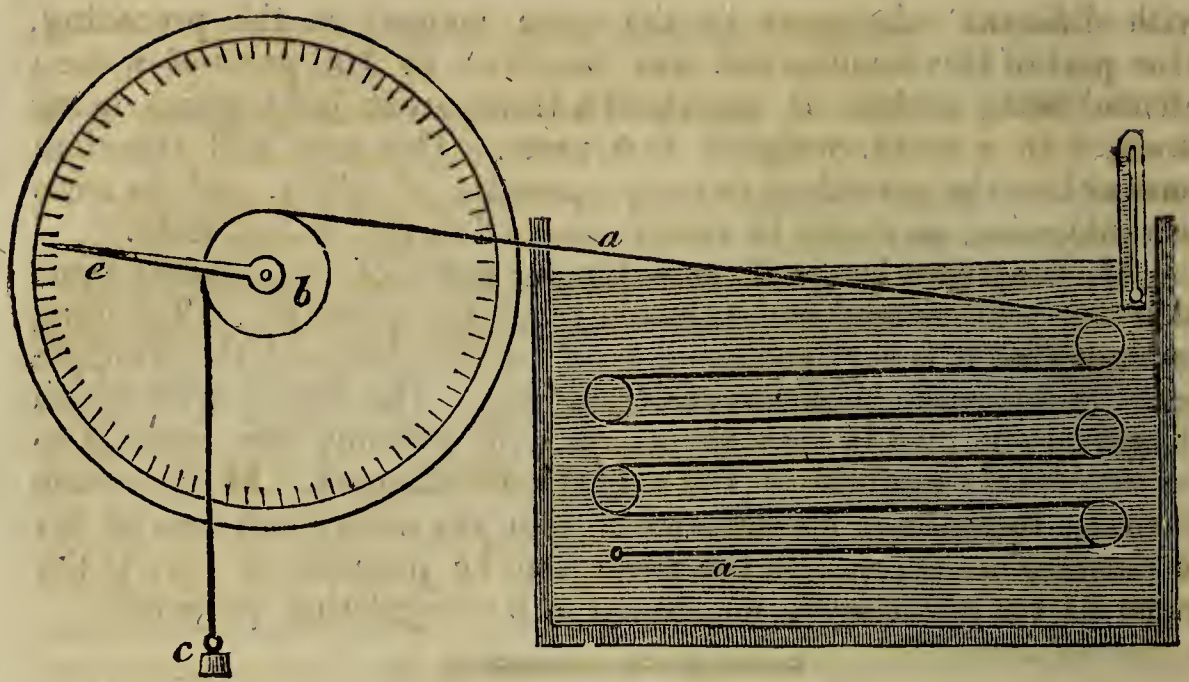
M. Bracconot has made an extensive series of experiments upon this newly discovered and valuable vegetable principle, all tending to shew that it is very analogous to, if not identical with the principle so little known under the vague term jelly. The facility with which it may be obtained in vast abundance will probably soon cause it to be extensively applied in the art of confectionary. M. Bracconot purposes to continue his researches into the nature and uses of his interesting discovery. In the mean time he proposes to give it the name of the *pectic acid*, on account of its coagulating properties.

Process for obtaining Elaine or Watchmakers' Oil.—The best oil for diminishing friction in delicate machinery, is that which is entirely deprived of every species of acid, and of mucilage, and is capable of enduring intense cold without congealing. The oil in fact should be pure elaine, without any trace of stearine.

Now it is not difficult to extract the elaine from all fixed oils, and even those from seeds, by the process of Chevreul, which consists in treating the oil with seven or eight times its weight of alcohol, almost boiling hot, decanting the liquid and exposing it to cold. The stearine will then separate in the form of a crystalline precipitate. The alcoholic solution is then to be evaporated to a fifth of its volume. What is left is the elaine, which ought to be colourless, insipid, almost without smell, without any action on the infusion of turnsol, having the consistence of white olive oil, and with difficulty coagulable.—*Bulletin Univ.*

Another method of obtaining elaine, more simple and exact than the former, is that adopted by M. Bracconot; which is to squeeze tallow between the folds of very porous paper, by which the elaine is absorbed while the stearine remains. The paper being afterwards soaked in water and pressed yields up its oily impregnation.

In the Annales de Chimie, March, 1823, another mode for obtaining elaine is given by M. Peelet, to which a preference over both the former processes will be given on account of the facility with which it may be procured in quantity. It is as follows: Pour upon oil a concentrated solution of caustic soda, stir the mixture, heat it slightly to separate the elaine from the soap of the stearine, pour it on a cloth and then separate by decantation the elaine from the excess of alkaline solution.



GURNEY'S PYROMETER.

The above engraving is a representation of Mr. Gurney's improved Pyrometer, which we saw some time since in that gentleman's lecture room, when he gave us permission to publish a description of it.

For ascertaining the relative expansibility of the various metals which can be drawn into wire, this invention is, unquestionably, the most sensible and accurate, of any hitherto constructed. And as the employment of pyrometers in this way constitutes their chief use, Mr. Gurney's will, probably, be very generally adopted; more especially on account of its great simplicity and little cost.

The wire *a* being attached at the lower end to a peg is passed successively round four or five little pulley wheels, fixed by their axles upon a piece of board, and arranged in the manner shewn. From the uppermost pulley the wire proceeds out of the vessel and passes over a small central wheel *b* of the dial plate, and from thence descending, a weight *c* is appended to that end, which preserves the wire in a state of tension. Thus prepared the apparatus is immersed in a vessel of water or other fluid heated to any desired temperature, which is ascertained by a thermometer being suspended therein. The expansion that then takes place by the increase of heat is accurately denoted by the index *b* on the graduated scale of the dial, the index being fixed to the central wheel moves round as the wire elongates. Upon abstracting the heat, the wire contracts, and draws back the wheel and index to its original position.

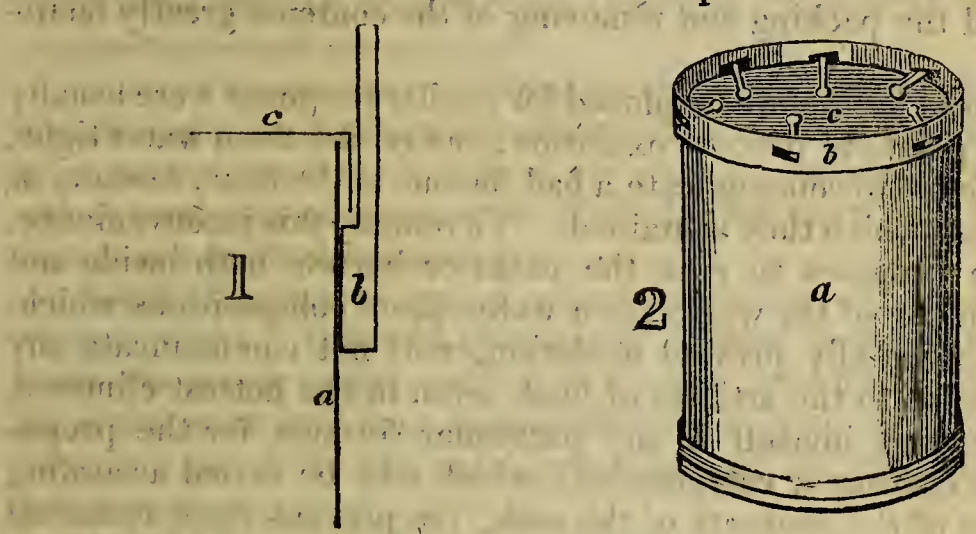
By this very excellent contrivance it is evident that a table of the expansibility of the metals, at given temperatures, may be formed with the utmost precision, which would become information of a most desirable nature in many branches of the arts, but particularly in the construction of time-pieces.

As the sketch for the preceding engraving was made from memory, it appears to us now that the central wheel of the dial on which the index is fixed, is drawn rather too large in proportion; for it must

be obvious that the smaller the dimensions of this wheel, and the larger those of the dial, the more sensible and delicate will be the indications of expansion. If the little wheel were to be one inch in circumference, and the circle of the scale 100 inches, then the elongation of wire to the extent of a tenth of an inch would cause the index to move over a space of ten inches. We understand that Mr. Gurney constructed one on these principles, that shewed even the variations in the temperature of the atmosphere with very great exactness.

DICKENSON'S PATENT METAL CASKS.

This is a recently patented invention by Mr. Robert Dickenson, of the Eagle Foundry, Southwark. The object of it is the preservation of provisions and other materials used on ship-board, or for exportation; but chiefly for the use of the British Navy. The improvements relate to two distinct points; first, the mode of constructing the cask itself, and second, in a method of applying a coating both outside and inside of the vessel that shall be alike impervious to air and water.



These casks are made of wrought iron, of a cylindrical form, with a seam, soldered or rivetted in the usual way. To strengthen the figure and adapt it for the reception of the heads, a strong iron hoop is rivetted to each end of the cylinder. These hoops are prepared at the iron works by rolling them into the form of a rebate, shewn in section at *b*, *fig.* 1. By this diagram it is also shewn that the hoop is fastened with its thickest part against the side of the cask *a*, about an inch below the extreme edge of the same; thus forming a deep groove between the sides of the cask and the thinnest part of the rebated hoop, for the reception of the flange of the head *c*, which appears to be made by bending the periphery of the circular iron plate to a right angle with its plane. Previous to the driving down of this head a sort of packing composed of hemp bands, or curriers' leather shavings, is to be rammed into the groove, so as effectually to exclude both air and moisture. To secure the bottom head in its place, the thin projecting edge of the hoop is to be hammered down upon the bottom, and over this is to be rivetted a flat iron ring to serve the purpose of the ordinary chimes of casks, the exterior edge

of which should extend a little beyond the periphery of the cylinder to defend the sides of the cask in rolling it.

The upper head of the cask is so constructed as to be removable at pleasure, the hoop which circumscribes it being the same as that on the bottom; but instead of being hammered down it is left erect, as shewn at *fig.* 2. The head is placed also within a similar groove, and is fastened down by means of a number of latch bolts. These latch bolts are attached to the head or moveable cover by means of a pivot at one end upon which they turn, and are driven sideways into long slots made through the projecting hoop; which slots are not made in a parallel line with the top of the cask, but aslant, so that when the latch bolts are driven into them by a hammer, they draw the flanged head into the deep groove, which, being previously packed in the manner before mentioned, makes the junction perfectly air and water tight. This kind of cover likewise admits of its being very readily removed, by driving back the latch bolts with a hammer; and the inconvenience formerly experienced in the smallness of the apertures in air tight vessels is herein completely removed, the opening being as wide as the cask itself; so that larger matters may be stowed in them, and the packing and removing of the contents greatly facilitated.

Metal casks heretofore employed for similar purposes were usually coated with paint, to prevent oxidation, and render them water tight, which was found to communicate a bad flavour to the flour, biscuit, or other materials which they contained. To remedy this inconvenience, the patentee proposes to coat the casks or barrels both inside and outside, with any of the well known water-proof compositions which, while they effectually prevent oxidation, will not communicate any unpleasant taint to the articles of food, even in the hottest climates. Without confining himself to any particular formula for the preparation of the coating or composition, which will be varied according to the nature of the contents of the cask, (to prevent those chemical changes which peculiar affinities would render them liable to) the patentee has selected the following, which may in general be used. To one pound of caoutchouc (Indian rubber) add 8oz. of black resin, and 2oz. of Venice turpentine; let the caoutchouc be cut into small pieces, and expose the mixture to a heat of 160° for the space of 24 or 36 hours. When dissolved, it is to be spread upon canvas or other fibrous material, and then passed between cylindrical rollers to give it an even consistency. With this material the casks are to be coated both within and without, except in the case of dry goods, such as biscuits, flour, &c. when the coating of the exterior alone is considered sufficient, and the interior surface of the iron may be bronzed in the same manner as gun barrels. For oils, tar, varnish, &c. the insides of the barrels have no coating, those materials being of themselves preservatives against oxidation. In some cases of dry goods, the inside may be coated with the thinnest and cheapest woven material or even paper, and these may be attached by any cheap kind of cement, by common glue, or paste; the object being to exclude the air and moisture in the cheapest, simplest, and most convenient

manner. The patentee being the inventor and manufacturer of the wrought-iron buoys now so much in use, and other machines of the kind, it need hardly be added that he has succeeded in constructing these vessels in the completest and most effectual manner.

PROCESS IN MANUFACTURING OF KELP.

This important article of commerce, so indispensible in many of our domestic manufactures, is extensively prepared in many parts of North Britain,* and several valuable papers on the method of conducting the process have recently appeared in the Transactions of the Highland Society of Scotland, one of them giving an account of the manufacture, *on the farm of Strond, in Harris, possessed in tack by Mrs. Anne Campbell,* being particularly deserving of notice, we make the following extracts therefrom.

"The process of manufacturing this kelp is as follows, and, though similar, may be found to differ in some respects from the general mode of kelp-making, wherein I consider this difference lies I will point out, by underscoring (printing in Italics) that part of the description of the process.

"1st. The ware is cut off the rocks with a common hook, similar to those used for reaping, but stronger, and having a rougher edge.

"2nd. *Care is taken* to land the ware on clean spreading ground, and if sand or mud is found to stick to the ware (sea weed) *it is always washed* before landing it.

"3rd. The ware is spread out every dry day, and made into small cocks at night. When in this way it is found to be pretty dry, *it is made into larger cocks,* and left to heat in them for *six* or *eight* days, but if the ware is of that description which grows in bays into which there is a run of water, *such ware is always left in large cocks from fifteen to twenty days.*

"4th. *The ware being thus secured,* a dry day, with a good breeze of wind, is watched for in order to burn it.

"5th. The kelp-kilns are constructed of middle sized stones, of hard texture, and built up carelessly; the outsides of the kilns are covered with turf; the length of each kiln is from fifteen to eighteen feet; breadth two and a half feet, height two feet. They are made on the surface of the ground, and on the firmest sward that can be found.

"6th. The process of burning is as follows; a small bundle of straw or heather is set on fire; the driest part of the ware is placed over this, and gradually added, until the flames become general through the kiln; then the ware to be burnt is thrown in little by little, till the whole is reduced to ashes. If, however, it happens that the day is too calm, or that the ware is not sufficiently dry, so that the ashes cool and cake into white crusts, *the manufacturer stops burning any more, until he rakes all the ashes in the kiln;* then commences burning again, and goes on in this way until he has the

* It is said that Dundonald, Lord of the Isles, receives annually from his kelp estates, from 20 to £30,000 per annum.

whole thoroughly burnt. Want of attention to this method leaves kelp of a white colour and of a porous texture.

"7th. The last process is the raking or working of the ashes with an iron with a wooden handle, made for the purpose, until the whole is brought into a solid semi-vitrified state. Most manufacturers commence this process immediately after the last part of the ware is put on the kiln, and when a good deal of the ware is not sufficiently burnt and of a black colour. The Strond manufacturers, however, *do not commence raking the ashes* for at least half an hour after the last of the ware is put on; so that the whole may be thoroughly burnt. Want of attention to this particular leaves kelp of an ugly black colour. The raking of the ashes is simply done by working the kelp-irons through it, until the whole becomes a semi-vitrified mass; three or four men are employed at this process. If fewer the ashes will not be sufficiently worked, and consequently a great part of them must be mixed in the next burning.

"Finally. The kelp is broken in pieces of about 2 cwt.: these are made into conical heaps, covered with dry ware, and over that is placed a layer of turf, which secures the kelp tolerably well, if early shipped."

N.B. The quantity of kelp manufactured during the last season on the farm of Strond was 115 tons, and sold at Liverpool for £10:5s:0d. per ton.

MISCELLANEOUS INTELLIGENCE.

Muriate of Lime, a valuable Manure.—M. Dubue, an apothecary of Rouen, has discovered that the muriate of lime is a very active manure or vegetable stimulant. He dissolves about 2¼lbs of dry salt (cloruret of calcium) in about 16 gallons of water, and with this solution waters the plants at distant intervals. He sprinkled a light soil with this fluid, and eight or ten days after planted it with maize, and from time to time during the season watered the corn with the same solution. Another portion of corn, at six feet distance, he watered with common water. The former yielded double the produce of the latter. A great variety of plants and garden vegetables were tried in the same manner and with similar results. The sunflower (helianthus) which in that place rises only to six or eight feet, grew by this treatment to the height of 12 or 15 feet, with flowers whose discs were 18 to 20 inches in diameter, producing seeds which yielded half their weight in oil *good to eat.*

Some potatoes were planted on the 1st of May, 1822, in two squares six feet asunder; the one was watered with the solution, and the other with common water. The produce was gathered on the 10th of November following. The bed which had been watered with the solution, and only three times during the season, produced potatoes six inches long, twelve inches in circumference, and weighing nearly two pounds each. The others were in general only half as large, and their stalks in the same proportion. Three or four waterings of this fluid at distant periods are considered sufficient.

Rapid Distillation.—Professor Oersted has pointed out a method of considerable utility in the evaporation of liquids. He fastens together a great number of fine metallic rods or wires, and puts them in the bottom of the still or evaporating vessel, and by this means he distils seven measures of brandy with the same fuel, which without the rods would distil only four.—*Bulletin des Sciences.*

Marsh's Patent Saddles.—The object of this invention is to give increased elasticity to the seats of saddles, as the wool and other materials usually employed for stuffing them, soon lose that desirable quality by the compression of the rider. For this purpose he employs a series of wire worm-springs, (the same as those used in garters, braces, &c.) which are placed lengthwise over the ordinary packing from the front to the back of the saddle tree, and attached to it by the web. The springs are then covered with cloth, and stitched to the packing, so as to keep them uniformly in their places. The saddle is afterwards covered with leather and finished in the usual way.

Effects of an Earthquake on the vegetation of Wheat.—It is a remarkable circumstance, that since the great earthquake of 1687, no wheat will grow on the coast of Peru. In some places, indeed, a little is raised, but it is very unproductive. Rice, on the contrary, yields a great return. Before the earthquake, one grain of wheat yielded two hundred grains.—*Edinburgh Phil. Journal, Vol.* 10.

Formula for the preparation of Sulphate of Rhubarb, by Dr. Carpenter of Philadelphia.—Boil for half an hour six pounds of coarsely bruised Chinese rhubarb in six gallons of water acidulated with two and a half fluid ounces of sulphuric acid ; strain the decoction and submit the residue to a second ebullition in a similar quantity of acidulated water ; strain as before, and submit it again to a third ebullition ; unite the three decoctions, and add, by small portions, recently powdered lime, constantly stirring it to facilitate its action on the acid decoction. When the decoction has become slightly alkaline it deposits a red flocculent precipitate, which is to be separated by passing it through a linen cloth and dried, after which reduce it to powder and digest in three gallons of alcohol, there then remains a strong solution of rhubarb, to which add as much sulphuric acid as will exactly neutralize it, evaporate this slowly to dryness, the residuum will be of a brownish red colour, intermingled with brilliant specks, possessing a pungent styptic taste, soluble in water, and its odour that of the native rhubarb.

This preparation is a concentrated form of the active principle of that valuable cathartic, separated from the ligneous and mucous portions, and bears the same relation to the crude substance, as Quinine does to Peruvian bark. It is well worthy the attention of physicians, as the quality of rhubarb is so various that the dose is very uncertain. This preparation will be of uniform strength, and may be administered safely to new-born infants.

Improved Quills.—It is said that M. Sholtz, of Vienna, has succeeded in preparing quills so as to excel those of Hambro' in firmness and durability by the following process. The quills are suspended in a boiler with their ends just touching the water it contains, the vessel is then closed steam-tight, and the quills are exposed to the heat of the steam for about four hours; by which means all the oil or fat is extracted, and they become extremely soft and transparent. On the following day they are hardened in a stove and cleared of the pith, by cutting the ends, and rubbing with a cloth. By this treatment they become extremely hard, very elastic, and highly transparent.

Georama.—An establishment under this title has been erected in the Boulevard de la Chausée d'Antin, Paris, consisting of a hollow sphere of forty feet in diameter, within which is laid out a general map of the world, executed by the best artists. A spiral staircase ascends to three circular and insulated balconies, whence the spectators can view every part of the sphere, even in its most minute details.—*Bul. Univers.*

Diamond.—It appears from specimens which now exist in several European cabinets that the veritable gangue of the Brazilian diamond is a brown oxide of iron.—*An. de Chimie, Mars,* 1823.

Blow-pipe Experiments.—The difficulty of subjecting very small particles of a mineral to the action of the blow-pipe is much increased by the want of a suitable support for such small portions of matter. J. Smithson has prescribed an excellent method. He flattens the end of a platina wire, and spreads over it a little paste made of porcelain, or pipe clay and water, and applies this to the powder or particle to be acted on. It dries and adheres in a few minutes, and may then be fully exposed to the flame.

If the clay should affect the desired action of the flame unfavourably, a paste may be made in many instances of the fine powder of the mineral itself, and used as a substitute.—*Technical Repository,* 15.

Wholesomeness of Brown Bread.—Dr. Majendie has shewn that if a dog is fed on white bread and water, and confined wholly to that diet, he will die within fifty days; but if the bran is left in the bread, no bad effects are experienced by the animal.

Natural History.—We are indebted to Mr. Bradley for a curious observation. He discovered that two swallows carried into their nest forty caterpillars per hour. The birds appeared to him to reside in their nest only twelve hours in the day; this would produce a daily consumption of 480 caterpillars, which in one week amounts to 3360, by a single pair of swallows.—*Rev. Ency. May,* 1823.

Constant setting in of the Tide into the Mediterranean, through the Streights of Gibraltar.—The cause of this singular phenomenon has been ingeniously assigned by Mr. Smith, to the evaporation of the waters of that sea being much greater than those of the contiguous ocean. By a series of experiments made with Six's self-regulating thermometers, around the island of Sicily, at

from twenty to forty yards deep, that gentleman found the temperature of the water to be from 73° to 76° Fahrenheit, while the water outside of the streights was found to be only from 63° to 64° at the same point of time. From this data, he argues that an increased evaporation is caused by the excess of heat of the Mediterranean, and to supply the continual lowering of the surface, there is a constant influx of waters from the Atlantic, through the *narrow-channel*.

Hydrophobia.—A medical gentleman has stated, that a few drops of any mineral acid put in the wound inflicted by a rabid animal, effectually prevents hydrophobia; it decomposes the saliva poison, consequently no bad effect follows.

Circulation of the Blood.—Dr. Kidd calculates that at each pulsation the heart expels about one ounce and a half of blood, and that as there are usually 375 pulsations in five minutes, thirty-five pints will pass through in that time, which is estimated as the total quantity in the body of an ordinary man; it follows, therefore, that as there are 288 five minutes in a day, the total quantity of blood expelled from the heart in 24 hours, is about 24¾ hogsheads.

Green Colour obtained by the mixture of Cobalt and Zinc.—When a mixed solution of cobalt and of zinc is precipitated so as to produce a mixture of oxides, it forms, after being well washed and dried, a white powder; and when this white powder is heated in a close vessel, it loses water, and becomes of a beautiful green colour, notwithstanding the cobalt does not amount to more than a sixth part of the whole. It is highly probable that this discovery may lead to the fabrication of a durable green pigment, which has heretofore been so much in request.

Steam Engines at Glasgow.—The number of steam engines employed in Glasgow and its immediate neighbourhood are as follows: in manufactories 176; in collieries 58; in the stone quarries 7; in steam boats 68; in Clyde iron sunk 1; in the whole 310; the total power is 6406 horses, making an average power to each engine of about 24½ horses.

Spray of the sea.—Mr. Dalton has ascertained that in some storms of wind the spray of the sea is blown more than thirty miles across the land. Some rain caught at Manchester he found to contain one part of sea water in 200 parts.

Voyage of Discovery.—Captain Beechy has sailed in the Blossom, for the Pacific. His instructions are to visit and lay down the precise situation of the Islands of Pitcairn and Otaheite, Easter and Friendly islands, &c. He is then to proceed to Behring's Straits, when his operations are to be connected with those of Captains Parry and Franklin.

Road-making.—In Mr. Mc. Adams's observations on the management of roads, he very candidly says, "the reason we require artificial roads in Europe is, that the soil becomes soft from wetness; were the natural earth always dry, nothing could be preferable, for being travelled upon it would never wear out, nor would any carriage, however heavy, sink in it. The object to be aimed at therefore, is to

keep the natural soil dry, and this may be done both by defending it from ground water, and from that which falls from above. In the knowledge of the measures requisite to effect these objects, consists the whole science of road making."

LIST OF NEW PATENTS.

FULLING MILLS.—To Alfred Bernon, Esq. of Leicester Square, for certain improvements in fulling mills. 7th June. Six months.

CANDLES,—To Moses Poole, Esq. of the Patent Office, Lincoln's-Inn, for the preparation of certain substances for making candles, including a wick peculiarly constructed for that purpose. 9th June. Six months.

VENTILATION OF HOUSES.—To John Burridge, Esq. of Nelson Square, Blackfriars-Road, for certain improvements in brick houses for their better ventilation, &c. 9th June. Six months.

CARRIAGE-WAYS AND WHEELS.—To John Lindsay, Esq. of the island of Herne, near Guernsey, for improvements in horse and carriage ways, and carriage wheels. 14th June. Six months.

STEAM-ENGINE BOILERS.—To William Henry James, of Winson Green, near Birmingham, engineer, for certain improvements in steam-engine boilers. 14th June. Six months.

WATER CLOSETS.—J. Downton, of Blackwall, for certain improvements in water closets, 18th June. Six months.

AXLETREES.—To William Mason, of Castle Street, Oxford Street, for certain improvements on axletrees. 18th June. Six months.

SHIP'S COMPASS.—To Charles Phillips, Esq. of Findsbury, Kent, for certain improvements in a ship's compass. 18th June. Six months.

STOVES OR GRATES.—To George Atkins, of Drury Lane, and Henry Marriott, of Fleet Street, for certain improvements on stoves or grates. 18th June. Six months.

NEW POWER.—To E. Jordan, of Norwich, for a new mode of obtaining power, applicable to machinery of different descriptions. 18th June. Six months.

PRODUCING OF STEAM.—To John Thompson, of the London Steel Works, Chelsea, and John Barr, of Halesowen, near Birmingham, for certain improvements in producing steam, applicable to steam-engines and other purposes. 21st June. Six months.

LOOMS.—To John Worthington, and John Mullener, of Manchester, for certain improvements in looms. 21st June. Six months.

COACH STEPS.—To Ross Corbett, of Glasgow, for a new step or steps for coaches and carriages. 21st June. Six months.

COMPOSITION FOR DYES.—To P. Brooks, of Shelton, Staffordshire, for the invention of a composition, and the application of the same to the making of dyes, moulds, or matrices, and various useful articles. 21st June. Six months.

SPINNING.—To J. F. Smith, of Chesterfield, for improvements in machinery for drawing, roving, spinning, and doubling cotton, wool and other fibrous substances. 21st June. Six months.

TO READERS AND CORRESPONDENTS.

H. L's Improved Distillatory Apparatus will, if possible, appear in our next number; the drawings are being engraved.

A User of Razors is informed that he should enquire for Water of Ayr stone.

H. Y's Letter is not clear; as far as we can understand the writer his invention is simply a common *lifting* pump; we recommend his perusing our description of that machine in number 14, page 221, of this Work.

The Letter from Sheffield, without signature, is really of a nature that renders it quite inadmissible in the Register.

R. S.—A Subscriber.—A Philanthropist.—Mechanicus, and X. Y. are received.

The Letter from Ann Willis will appear in our next.

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REGISTER
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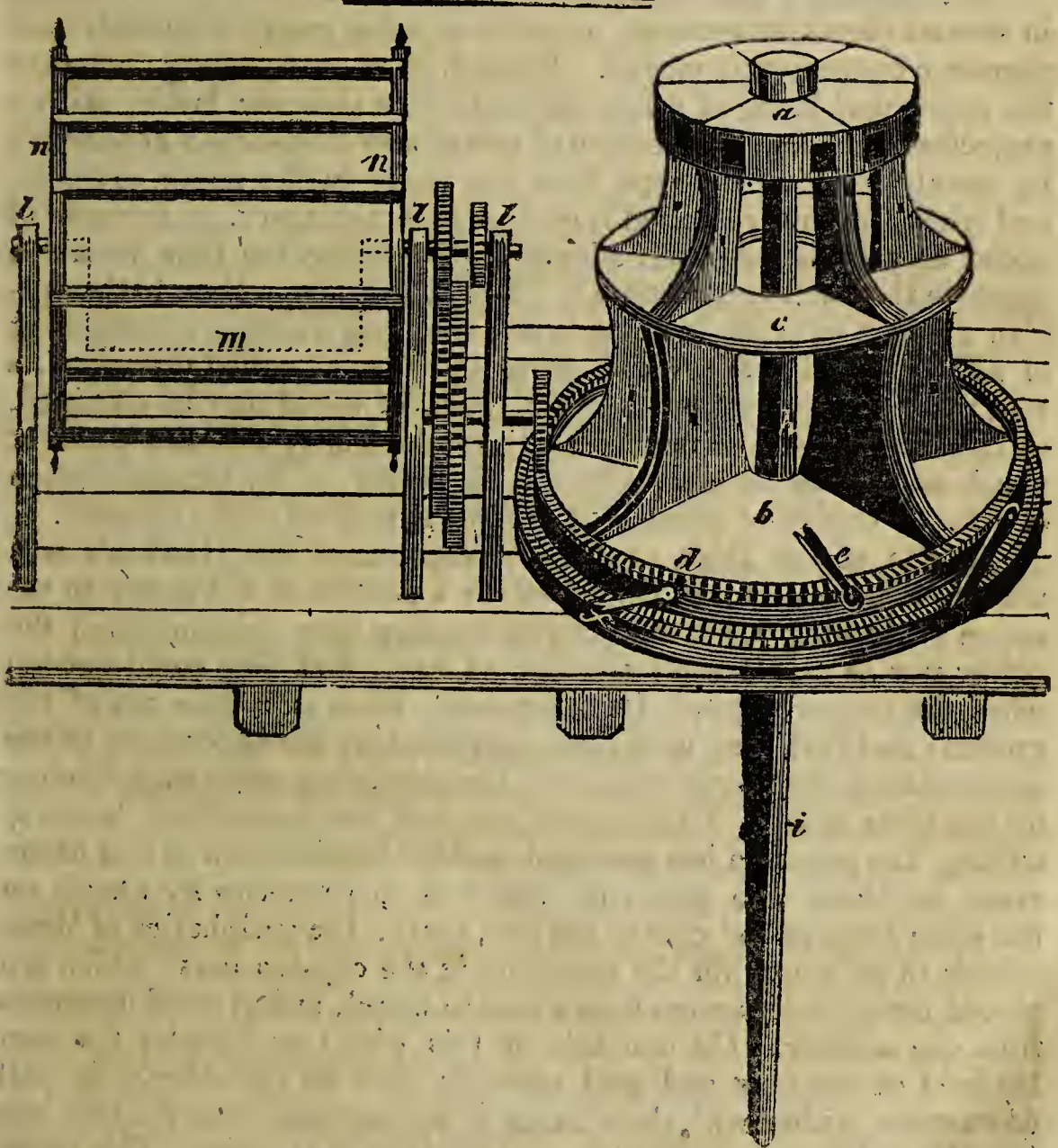
CONTENTS:

Hawkes's Patent Capstan, - - - - - - - 17
Donovan's Improved Filtering Bottles, - - 20
Gibson's Patent Hats, - - - - - - - - - 22
Hancock's Patent Substitute for Leather, - 22
Cultivation of the Potatoe for collecting the Potash, - - - - - - - - - - - - - 23
Patent Mode of Ventilating Houses, - - - 23
Patten's Balance Beam, - - - - - - - - 23
Saintmarc's Patent Apparatus for the Distillation of Brandy, &c. from Potatoes, - - 25
Mechanics' Institution, - - - - - - - - 27
Remarkable Swarming of Fleas, - - - - - 28

MISCELLANEOUS.—Manufacture of Artificial Tortoiseshell, 29—Improvement in the Camera Lucida, ib.—Composition of Pakfong, or White Copper, ib.—Ingots of Copper formed Via Humida, 30.—Recipes, for making Lacquers for Brass, and Seed-lac Varnish, ib.—Preserving ingredient in Egyptian Mummies discovered, ib.—On the Boiling Point of Fluids, ib.—Exposure of iron to the air on the top of St. Paul's, ib.—Improvement in Penknives, ib.—Patents, Correspondence, &c. . 32



HAWKES'S PATENT IMPROVED CAPSTAN.

THIS is one of those inventions that requires only to be made known to be generally adopted, in preference to the unwieldy and inefficient machines for the same purpose at present in common use. The latter,

are usually made in one cumbrous *inseparable* mass, have only *one* power, which is put into operation by means of levers called capstan bars. When manual force is applied to the extremities of these levers, (which are ten in number) it is of course the most advantageous mode of acquiring power by such a machine; but as only ten men can thus exert themselves with proper effect, and the united power of a hundred is frequently required in the working of a ship, it clearly follows that nine-tenths of such power is misdirected in a greater or lesser degree, according as each man may be situated nearer to, or farther from, the head of the capstan.

To remedy these glaring defects in the ordinary ship's capstan has been the object of the patentee,* who, being professionally a surveyor of shipping, and of great experience in all matters of the kind, is well qualified for such a task.

Mr. Hawkes's first improvement consists in forming the capstan in several pieces or sections, capable of being easily disunited, and therefore conveniently moved. Second, in so constructing them that the upper part being of a less circumference than the lower, with a projection between, an increase of power may be obtained at pleasure by merely slipping the rope from the lower to the upper division; and when the power applied is greater than necessary, an increase of speed may be immediately obtained by shifting the rope from the upper to the lower compartment. Third, in giving motion to the capstan a winch or crank is made to operate upon a simple arrangement of wheels and pinions; which being in pairs, of varied diameters, a vast additional power, or a great increase of speed may be obtained, as circumstances may require their employment; and the crank or winch may either be turned by manual labour, or by the application of a steam engine to which it is obvious it may be easily adapted.

In one of the ships to which a capstan of Mr. Hawkes's was affixed, some dislike was expressed by a portion of the crew, to the action of turning a winch, notwithstanding they acknowledged the power was so great, and its motion so easy, that they could not tell when the anchor tripped (which means, when it is torn out of the ground) and that they were often surprized by the appearance of the anchor above the waves when they imagined they were only winding up the loose cable. To overcome this and every objection, however trifling, the patentee has provided another modification in lieu of the crank for those who prefer it; which is to place two fly wheels on the same axles as the crank, ten feet apart; the peripheries of these wheels to be scored for the reception of the capstan bars, which are placed horizontally across from wheel to wheel, and at equal distances from one another. On one side of this wheel or cylinder the men lay hold of the bars and pull upwards, and on the other they pull downwards, either with their hands or by stepping upon the bars one after the other as they revolve, and thus weigh it down. This being a motion which seamen are much accustomed to in going up the shrouds, will probably receive the preference over the crank; either

* Mr. George Hawkes, No. 9, Lucas Place, Commercial Road.

of them are however very effective, as the force is applied wholly at the right part of the lever, or that which is at the greatest distance from the fulcrum.

We are aware that to this part of our argument it may be replied, that in the common capstan a rope is *sometimes* passed round and attached to the extremity of each capstan bar, forming therewith in effect a complete horizontal wheel; round the periphery of which the men are arranged, and holding by the rope apply their strength at the right point for gaining power.

It might, we think, be easily shewn that individual exertion is much impeded by thus crowding the men into one circular line, and consequently that very little additional power is gained by the expedient; but it would be a needless task to undertake the proving of it, as there is another consideration of such paramount importance, which seems to establish, beyond all doubt, the vast superiority of Mr. Hawkes's plan over the common mode.

Mr. H. R. Palmer calculates that the strength of a good horse upon an average, is equal to the drawing up of a weight of 150lbs. suspended over a pully, at the rate of $2\frac{1}{2}$ miles per hour; the horse moving in an horizontal line. Now we think it will not be questioned that six men cannot draw more than one horse, therefore each man may be said at the utmost, as applying a force of but 25lbs. to the capstan bars when employed in the ordinary way; but arrange these bars in the manner now proposed by Mr. Hawkes, by which a man may step upon them, or hang upon them with his hands, it will then be seen that one man does as much work as six men, or as one horse, and almost without any labour; for it must be admitted that the average weight of a man is at least 150lbs. the whole force of which he communicates to the cylinder.

The preceding engraving exhibits the patent capstan complete for one deck.

a is the *drum-head*, of cast iron, with holes for the insertion of the capstan bars in the ordinary way, to be used as a separate, or as an additional power, if required upon any accident or emergency; *b* is the *paul-head*, *c* is the division between the greater and lesser power, over which the cable or other rope is slipped to alter the power or the speed, as before mentioned. This contrivance likewise admits of two ropes being worked at the same time by the capstan without interfering with each other, an advantage of very great importance on some occasions, especially as any required power for that purpose may be obtained by this highly improved machine. In the figure the capstan is shewn as divided into six sections, or equal parts; the number of these sections may, however, be varied from three to eight, according to their size or weight; the divisions are made vertically the whole length of the capstan, dividing also the *whelps*, the plates of which being strongly bolted together, makes it into one firm and compact body, and renders it capable of being easily disunited and removed.

A series of ten *pauls* are suspended round the periphery of the paul-head, five of which are in operation at a time, as that shewn at *d*; the other five are kept turned up in readiness for use, when the

motion of the capstan is reversed; each of these pauls have two clips, which take into two teeth at the same time at every half inch of the revolution. The inner circle of teeth is for one set of pauls, and the outer for the other set of pauls, the notches being in contrary directions; both circles are enclosed within the *paul-rim f*. The *pauling* of every half-inch in the revolution, prevents those violent and injurious shocks experienced in ships with the common capstan when the rope *surges*.

h is the central shaft of wrought iron, made square, except at the bearings which are properly turned; this shaft may be fastened under the beams of the deck, or it may be continued down to the deck below, as shewn at *i* if preferred. *l l l* are three iron standards for supporting the gear which give motion to the capstan, which may be worked either by a winch or crank, as shewn by the dotted line at *m*, or by means of the capstan bars placed horizontally round the periphery of two vertical wheels *n n* fixed on the same axles as the crank, the circumference of these wheels being scored in a proper manner for allowing the bars to be dropped in and fastened by pins, so that the bars might be quickly removed at pleasure, to be applied in the way most desirable for the occasion.

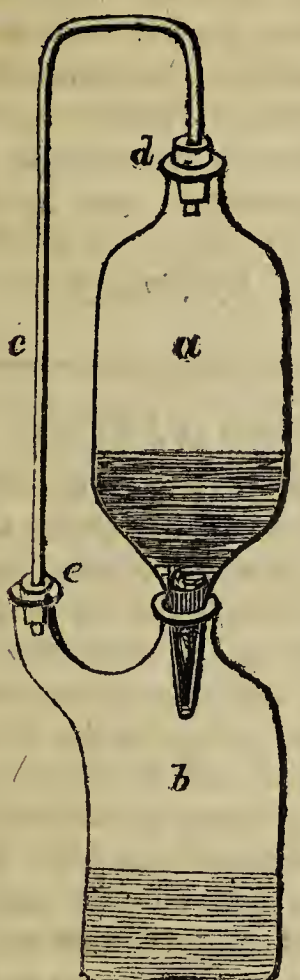
The shaft which carries the two cylinder wheels, bears also two pinions, one of which is shewn in the gear with the smallest circle of a double cogged wheel; and on the same shaft as the latter is placed a pinion, which takes into the circle of cogs fixed on the upper surface of the paul-head, and causes it to revolve. The power of the capstan is thus multiplied in proportion to the relative diameter of the several wheels. If it be desired to have still more power, a vast accession is immediately obtained, by putting the small pinion into gear with the larger circumference of the double wheel, which is done instantly by the lever apparatus, ordinarily used for that purpose. Lastly, if it be wished to add a greater power still, the bars may be applied to the drum-head of the capstan in the old way. So that there are in this machine a choice of several ways to get power by the simplest means, all of which may be employed together, if required, to produce a prodigious effect. It takes up much less of the useful room upon deck, and enables a quarter of a ship's company to do more work with less labour to themselves, than the whole company can by the old-fashioned machine.

MR. DONOVAN'S APPARATUS FOR FILTERING IN CLOSED VESSELS.

The object of this very convenient apparatus, is the filtering of fluids out of contact with the atmosphere; alkaline solutions may thus be preserved in their caustic state, by preventing the absorption of carbonic acid by the alkali.

In the preparation of pure potash, when the carbonate of potash, the hydrate of lime, and the water, have been exposed for a while to each others action, the mass becomes so absorbent and of such a consistence as to pass the filter very slowly, and with great difficulty.

Experiencing inconveniences of this nature Mr. Donovan contrived the annexed apparatus, by which the process of filtration may be conducted with the total exclusion of the atmosphere.



a is a bottle of *green** glass with a funnel shaped end inserted into another bottle *b*, the junction being luted or ground to fit closely; the neck *d* of the upper vessel has a cork tightly fitted to it, perforated in the middle for the reception of the glass tube *c*, which being bent downwards enters the branched neck *e* of the lower vessel, thus connecting them together, and opening an air passage between them. The funnel-shaped end of the upper vessel has a piece of linen loosely rolled up, placed in it for the purpose of filtering, but in filtering the corrosive acids a stratum of pounded flints should be employed instead of the cloth.

To charge the upper vessel with the alkaline solution, the tube *c* must of course be removed, and the first droppings should be allowed to run to waste previously to the apparatus being fitted together, that no absortion of carbonic acid may take place in the filtered liquor. When the whole is properly closed the filtration will proceed without the possibility of any absorption taking place.

Now it is evident that no liquor can fall from the upper vessel without an equal volume of air entering it, and that none can enter the lower without an equal bulk of air escaping from it. Both of

* Mr. Donovan recommends *green* glass in preference to white, being less liable to crack by the action of fixed alkalies.

these conditions it is obvious are fulfilled by the connecting tube *c*, the air being expelled from the lower to the upper vessel, at every dropping of the filtered liquid. The whole process is therefore conducted without access of more air than the vessels first contained, and in the most cleanly and perfect manner.

The utility of this excellent contrivance is very extensive. The most volatile liquids, such as ether, alcohol, ammoniacal liquors, essential oils, &c. may be filtered without loss, as the vapours cannot escape during the operation; and by the exclusion of the atmosphere in the filtration of a variety of fluids, other injurious effects, to which they are subject, by the common process, may be entirely obviated.

GIBSON'S PATENT HATS.

This is a new patent invention by Mr. John Gibson, a hatter, of Glasgow, and the object of it appears to be the making of a very cheap, light and elastic fabric for hats, caps and bonnets.

The substance to be employed is whale-bone, which is to be divided into filaments about the thickness of hay stalks, and then boiled in some alkaline lixivium to extract the oil, which confers likewise an increased elasticity to the whale-bone. The filaments which will vary from one foot to twelve in length are then to be sorted, for the purpose of being converted into a kind of cloth. The longest threads are therefore selected for making the warp, and the shorter for weaving the weft;—this part of the process may be conducted in the ordinary loom used for weaving cloths of horse hair.

In some cases the patentee proposes to weave the weft with other materials in lieu of whalebone, in order to produce the required elasticity in one particuiar direction. After weaving, the cloth is to be pressed between cylindrical rollers.

To make up this material into hats and bonnets, the cloth is to be cut into the proper forms, sewed together at the joints, and stiffened by some elastic resinous varnish.

HANCOCK'S PATENT SUBSTITUTE FOR LEATHER.

In our 29th number vol. ii. page 68, we gave an account of Mr. Gunby's patent process for the manufacturing of an elastic coating to flexible substances, to be used as a substitute for leather. The present invention, for which also a patent has been lately taken out, by Mr. Thomas Hancock, of Goswell Mews, Goswell Street, is for the manufacture of a similar substance, but the process is much simpler, the materials being very few in number.

Instead of using cloth, Mr. Hancock proposes merely to hackle or card the fibres of flax, cotton or wool, by which they are drawn out into layers of a suitable thickness, then felted together in a trough of water, and afterwards pressed between cylindrical rollers The fibres being thus united into a sort of felt of an uniform consistence, liquid elastic gum (caoutchoue, or Indian-rubber) is then to be spread

over the fabric, by means of a spatula. When the caoutchouc has sufficiently solidified it is to be again pressed, then receive another coat of gum, and again pressed.

If the material is intended to imitate black leather, iron troughs are recommended as preferable to be employed as moulds for laying the materials in, as the tinging effect of the metal is of no consequence. In other cases, wooden troughs should be used.

Cultivation of the Potatoe for obtaining Potash.—In consequence of the contradictory accounts given by experimentalists as to the produce of potash from the stalks and leaves of potatoes, M. Mollerat undertook certain experiments on the subject. He found in 1818 that the green crop gave its *maximum* of potash immediately before the flowering of the plant and its minimum at the time of maturity. At that time he determined to ascertain the effect of the leaves on the roots, in order to ascertain whether there would be any advantage in collecting the alkali, but had not the opportunity of making the experiment till 1824. A silico-argillacious soil, rich in alluvium and manure, was then planted with the potatoe called *patraque jaune*, one of the most productive species, the cultivation being carried on with care.

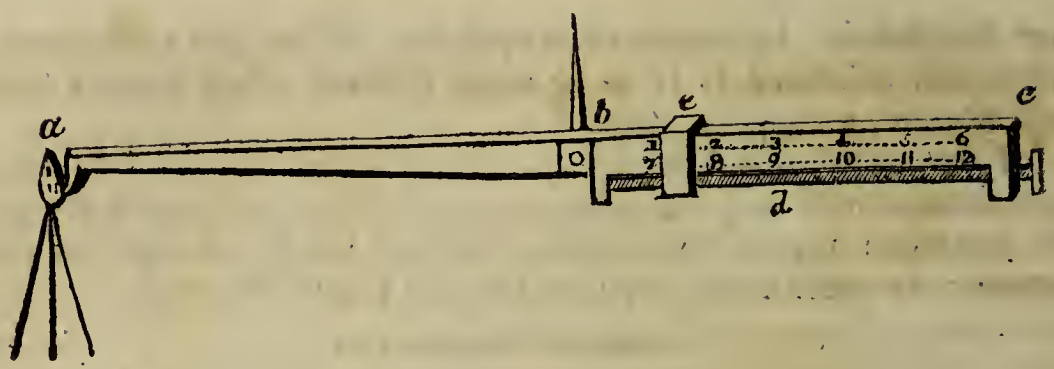
An account is then given in a tabular form of the produce in green crop, salts, and sub-carbonate of potash, at the time of each cutting, and of potatoes collected when the plant was mature; from which it appears that there would be no advantage in collecting the potash of potatoes unless two crops were obtained in the year. For this purpose the first potatoes must be planted early, and after the first cutting, which should precede the flowering, the earth should be turned up and a second plantation made, which should have time to yield its crop in a convenient state before the end of the season.

Animal manures improve the vegetation, principally as it affects the leaves, whilst gypsum mixed with the soil, makes the plant more productive in tubercles. See *Quarterly Journal, July*, 1825, or *Ann de Chimie*, vol. 28, p. 165.

Patent Houses, &c.—Mr. Burridge, author of the Prevention of Naval Dry Rot, also the Tanner's Key, has, we are informed, obtained patents for making improved ventilating bricks, stones, &c. capable of admitting free currents of pure air to all parts of buildings, particularly to the ends of beams and joists, between floors, roofs, &c. The object in view is to render wood equally durable as walls.

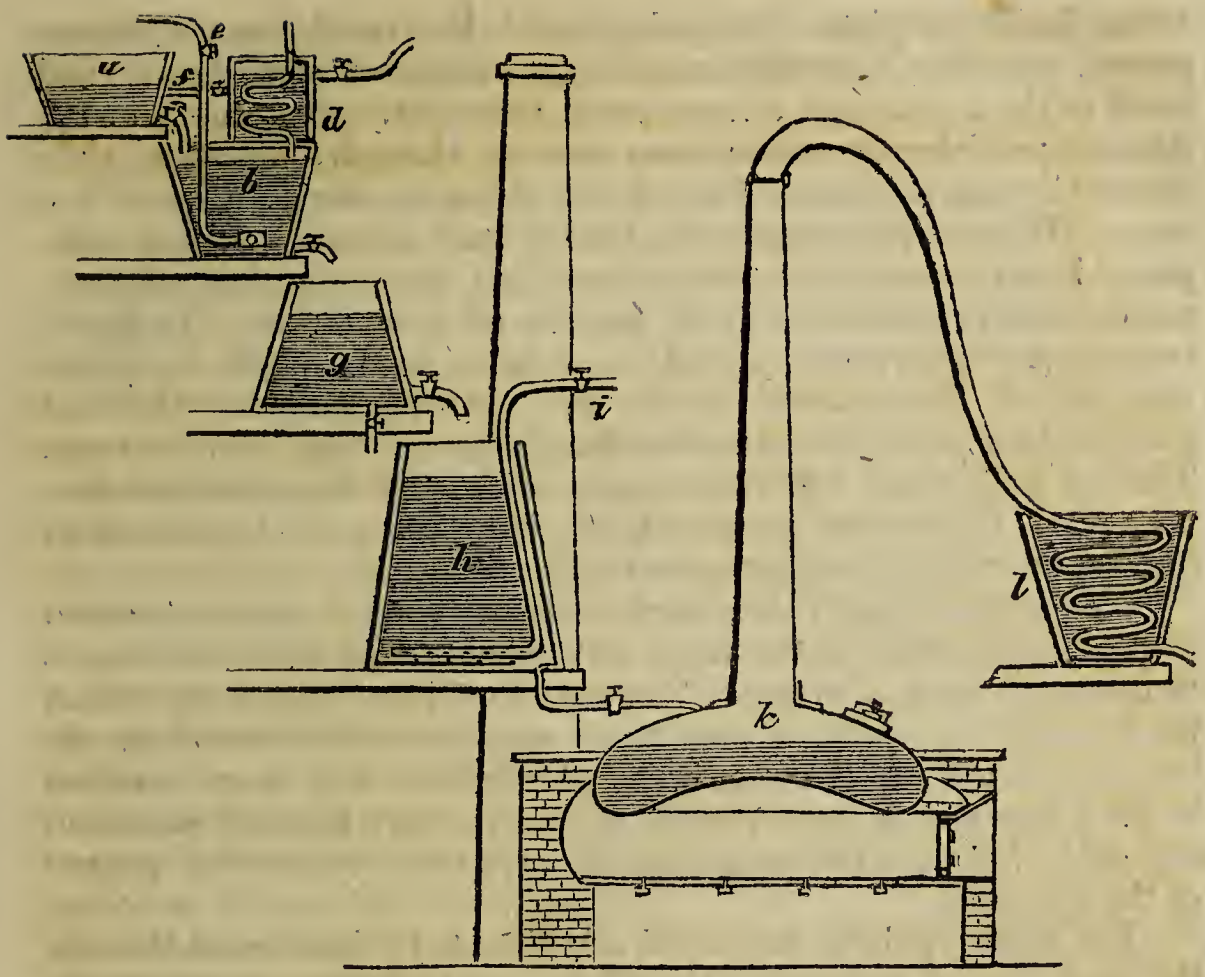
PATTEN'S BALANCE BEAM.

This is an instrument lately invented by Mr. Joseph H. Patten, of Newport, R. I. United States, for the purpose of taking the specific gravities of different bodies, and for the accurate weighing of very minute quantities of articles. The annexed description is from the pen of the inventor, and is extracted from the last number of the American Journal of Science.



" One great objection to the usual balance is the difficulty of getting the points of suspension of the scales to be at equal distances from the point of suspension of the beam; another is the friction—this alone is sufficient to prevent the substance to be weighed from containing an *exact* quantity of matter with the weight used; for suppose a beam to be so nicely constructed as to turn with the tenth of a grain—now to weigh a hundred grains, that weight will be put into one dish and the substance into the other, but the tenth of a grain must be added before the scale can turn perceptibly, it therefore exceeds one hundred grains by the tenth of a grain, and the weights can only be equivalents when the index is at rest, which may be any where within the quantity required to turn the beam—sufficiently accurate for all *common* purposes, but not for weighing the gases and taking accurately specific gravities; and in analysis where the weights are often repeated it amounts to considerable. The only accurate method is to make the weight itself the standard. (I believe a French proposition.) To do this is the object of the beam *a b c* (*fig.* 6) made of steel, sufficiently strong but light. The dish is suspended at *a*, the beam itself upon an axis at *b*; at *c* is the milled head of a long screw that is fitted with a shoulder and axis, and goes through the slide *e*, that traverses upon *b c* and carries the weight *d*: Now suppose it is wished to obtain ten grains, place that weight in the dish *f*, and screw back the weight *d* until it exactly counterbalances it. If the weight be now removed and a quantity of the substance to be weighed be substituted until the index points to where it did at first, there will then be very nearly the exact weight with but a small allowance for friction; for were this beam a common one, and so nicely constructed as to turn with the 100th part of a grain, it would, by making the distance from *a* to *b* four times greater than from *b* to *d* the point of suspension of the weight, turn with the 400th part of a grain. It is apparently an objection that 100 grains at *a* will require 400 at *d*, but the fact is settled by Coulomb, that this kind of friction does not increase in an equal proportion with the weights used; that is, if with a pound in each scale, a beam turn with one grain, if there were two pounds in each it would not require two grains.

" This beam may be used as a steel yard by screwing the weight *d* to any number marked upon the scale, and should a greater quantity be required than that marked in the first line, another weight double of *d* may be substituted."



SAINTMARC'S PATENT APPARATUS AND PROCESS FOR THE DISTILLATION OF BRANDY FROM POTATOES.

The distillation of alcohol from potatoes has been for some time practised on the continent with great success. The present apparatus and process are both of foreign invention, and the patentee for this country is Mr. Jean Jacques Saintmarc, of Belmont Distillery, Vauxhall.

The potatoes are first washed in the common machine used for that purpose which consists of a hollow cylinder, the periphery of it being formed by open rails placed a little distance apart from each other; the cylinder is immersed in a vessel of water, and a rotary motion being given to it the dirt is quickly removed.

When the potatoes have been thus thoroughly cleansed from the earth which adheres to them, they are taken to the mill and ground into pulp; but as this mill differs in no *material* respect from that described in our 18th Number, (with engravings) we must refer our readers to that article, to prevent an unnecessary repetition, and pass on to the application of the potatoes after having been reduced by the mill.

The pulp is first mixed with a large quantity of water, which takes up the chief part of the contaminating brown colouring matter, and it is then poured through a coarse sieve, which detaining those pieces of potatoes that have escaped the mill without being ground into pulp, they are rejected as ineligible for fermentation, and applied

to the feeding of pigs. The pulpy liquid, thus freed from the coarser pieces, runs into a trough containing a number of small holes, and lined in the inside with a linen cloth, sufficiently fine to prevent the floating particles of starch from passing through; the water then drains through the linen, leaving the pulp and starch to settle in a mass. When it has sufficiently drained, and become solid and compact, it is removed from thence and laid upon a plaistered floor, which rapidly absorbs a great portion of its moisture. To dry it entirely it is afterwards placed in a kiln or stove, which completes that part of the process. In the dry state the pulp may be kept uninjured for years, and may therefore be stored away for future use. The wet pulp being however equally serviceable for immediate fermentation, there is no occasion to dry it, if the several processes in distillation can be carried forward at the time.

Supposing the pulp to be used in the dry state, it is cut or broken to pieces and mixed in the vat *a* with sufficient hot water to bring it to the consistence of cream. The vessel, *b*, lined with lead, called the *decomposing vessel,* is then to be supplied with water about six inches in depth; to this a quantity of sulphuric acid is to be added in the proportion of three pounds of acid to every hundred pounds of *dry* pulp, but only two pounds of the acid to every hundred pounds of the *wet* pulp.

The diluted pulp in the vessel *a* is then to be discharged through the cock into *b* containing the diluted acid; further quantities of pulp and acid may in like manner be prepared until the decomposing vessel is sufficiently filled. Steam is then to be admitted from a boiler (not shewn in the engraving) by turning the cock in the pipe *e,* which descends to the bottom of the vessel, where it is made to issue from a steam box; the heat causes the mixture to boil, and after four or five hours ebullition the decomposition is considered complete. Before however describing the next part of the process, we should notice that a worm-tub *d,* supplied with water from the service pipe, is placed on the top of the decomposing vessel; the vapours from the boiling liquor beneath enter this worm, and are therein condensed by transmitting their caloric to the surrounding water; and the water thus made hot, serves for replenishing the vat *a* with fresh portions from time to time as it may be required, by means of a connecting tube *f* furnished with a stopcock.

The contents of vessel *b,* after decomposition, are discharged into the *saturating vessel, g,* and during the time that is running, a quantity of lime or chalk in solution may be poured amongst it, as long as any effervescence continues, which will vary according to the degree of concentration of the acid; but in general three pounds of chalk or lime will be found sufficient to saturate each pound of sulphuric acid employed in the preceding part of the process.

The liquid in the saturating vessel having now become transparent, it is to be drawn off into the *fermenting vat, h,* placed beneath, leaving the precipitated sediment undisturbed at the bottom whilst the clear liquor is running. The discharge cock being closed, the sediment may be stirred up with a quantity of water, to take up

whatever saccharine or fermentable matter it may contain; this should be allowed to settle again, and then added to the former liquor in the vat beneath.

To promote the fermentation a quantity of yeast is now to be added to the liquid in the proportion of three pounds to every hundred pounds of potatoe pulp. During the fermentation, which usually occupies from fifteen to twenty days, the temperature of the liquid should be preserved at from 90 to 100° Fahrenheit, and the atmosphere of the room where it is conducted at from 80 to 85°.

The patentee having discovered that the introductiou of hydrogen gas facilitates the fermentative process, besides increasing and improving the product, further directs that the vat should be furnished with the tube *i*, along which the gas is to be forced by means of a pump into the liquid. The tube after descending to the bottom of the vessel, takes an horizontal serpentine course; in this part it is perforated with numerous small holes, through which the gas escapes and bubbles up through the liquid. This injection of the gas should be continued until the carbonic acid gas in the upper part of the vat contains an excess of the hydrogen. The patentee is of opinion that the introduction of hydrogen gas may be very advantageously used not only in this process, but in the fermentation of all matters from which spirit or alcohol is to be extracted.

When the vinous fermentation has ceased, the liquor is to be drawn off through the tube into the still *k*, which is shewn in section built over the furnace. This still is of the ordinary construction, except that instead of having a large head or capital, it has a long neck rising perpendicularly from the body, the object of which is, that the aqueous part of the vapours may be condensed before entering the inclined part, and fall back into the still; while the more volatile or spirituous pass on alone into the bent arm and from thence into the refrigeratory or worm tub *l*, where it is converted into the ordinary first product of distillation, called *low-wines* (which is a very weak spirit.) The low-wines are then taken to another apparatus, which the patentee calls his *low-wine still*, to undergo a fresh distillation; and as a description of this still is particularly deserving of attention, we shall give an engraving of it in our next number, and at the same time conclude our account of the process.

MECHANICS' INSTITUTION.

On the 29th of July Dr. Birkbeck, the president, delivered the first lecture at the new Theatre of the Institution in Southampton Buildings, on the general principles of mechanical science. The principal feature of the lecture was the description of a machine, invented by one Dyer, in America, and not yet brought into use in this country, which acts as a crane for raising weights with a power far beyond any before known. The learned doctor said it was scarcely possible to imagine any machine more simple or more powerful, occupying the same space. The small machine exhibited, which

consisted of a wheel six inches in diameter, with oblique leaves (or cogs) worked by a spiral groove in an axis or arbour, raised a weight of 500lbs. by the application of a weight of 8lbs; and was found sufficient to balance the 500lbs. The inventor has applied his contrivance to the construction of clocks, by which he makes clocks with but three wheels, go twelve months without winding up. One of these clocks was exhibited. There were upwards of a thousand members present, and the high interest they took in the proceeding must be highly gratifying to the founders of the institution.

SWARMING OF FLEAS.

We have received the following letter, which we feel ourselves compelled to insert on the score of humanity.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"I LIVE in an inn-yard where several waggons bring in goods from the country and take out goods for different parts. The packages are continually coming and going, but whether they bring fleas with the packages, or whether they breed among the straw in the warehouses, I cannot say, but every now and then my house is swarming with them, and they sting most sharply. I wash and scour the lower part of the house every evening (Sunday excepted) after the family has retired to rest, and wash and scour the upper part of the house every forenoon (Sunday as before excepted) but cannot master the fleas. I have laid wormwood and black sallow leaves fresh gathered.—I have used hot lime,—washed the floor, &c. with a decoction of bitter apples, &c., and when I have thought I had conquered them, they have returned with redoubled fury,—I have used a number of different articles without effect—I at last thought that through the channel of your useful publication, some of your readers might give some direction or information how I might get rid of such unwelcome guests. The persons that occupied the house before, had green baize floor cloths, they were done with something that killed the fleas. They did nothing but dust and shake the cloths morning and evening. They never complained about them, for the fleas met their bane as soon as they entered the apartments, so that they had only to shake the dead fleas from the green baize floor cloths. I never could find where the persons that occupied the house before me went, or I certainly should have inquired of them. If it should meet your approbation, the insertion of this in your valuable Register of Arts,

"Will much oblige,

"*West Smithfield* "Your humble Servant,

"ANN WILLIS."

P. S.—It is not a flea or two that comes, they come in a *swarm*. The house has been free of them for several days, not a flea to be

found, and then of a sudden the place is all swarming, just as if they had been shot out of a sack into the rooms. I have been informed that in the borough, at an inn there, a poulterer had a ware room to put his baskets, &c. in, which was swarming with fleas. A dry-salter and oil-man took part of it (it being a large room was more than the poulterer wanted) upon his bringing in different articles that he deals in, the fleas vanished, and the place is now clear of fleas, which shews that they may be got rid of. A. W.

MISCELLANEOUS INTELLIGENCE.

Tanned Gelatine, or Artificial Horn.—A manufactory has been established in Paris for the construction of a variety of ornamental articles with this substance. The gelatine is usually obtained from bones, by treating them with a weak solution of muriatic acid, and it is afterwards tanned by the common process, as in making leather. Upon becoming hard and dry it assumes the appearance of horn or tortoiseshell, and is employed for the same purposes as those natural productions. It is softened by being boiled in water with potash, when it may be formed into any shape, and the figure preserved by drying the articles between moulds. In the soft state it may also be inlaid with gold, silver, or other metals, and it may be streaked with various coloured materials so as to resemble the finest and most beautiful woods. It is probable that this substance will soon be brought very extensively into use, on account of its elegance and cheapness.

The Camera Lucida of Dr. Wollaston has been so modified by J. B. Amici, a professor of Modina, as to remove the difficulty experienced by most persons in their first attempts to employ this ingenious and useful instrument. We have not heard of any improvement upon it having yet been made in this country, the introduction of which would be worthy the attention of our opticians, as a great many camera-lucidas might be sold by them, if they were to render a proper use of them less difficult of acquiring.

White Copper.—M. Frick, a German chemist, has formed several alloys in imitation of white copper, or the *Pakfong* of the Chinese. A mixture in the following proportions: viz.—copper 41.75,—nickel 32.25,—zinc 26.00 composed a greyish alloy, a little malleable when cold, not at all when heated; flattening with difficulty.

In another mixture of copper 50.00, zinc 31.25, nickel 18.75 produced a white metal, susceptible of beautiful polish, easily flattened, malleable when cold, unalterable by the atmosphere, and sonorous like silver.

A third mixture of copper 53.39, zinc 29.13, nickel 17.48, produced an alloy more nearly resembling silver in colour and sound. It was harder than that metal, very tenacious, and extremely ductile.

Ingots of Copper obtained by a precipitation of the metal from its solution.—When copper in solution is precipitated it is usually in the state of a fine loose powder. The following fact however, observed by M. Mollerat in his manufactory for the preparation of vinegar from wood, in Burgundy, will shew that ingots of copper may be obtained, via humida. In the process of preparing sulphate of copper, by calcining the copper with sulphur, solutions of the sulphate are obtained, which become turbid by the separation of a soluble sub-sulphate. These are placed in a tub half sunk in the ground to become clear, when it is observed that small buttons of metallic copper are formed on the interior surface of the tub and always at the junction of two staves; and there is no doubt that these buttons would ultimately become masses of considerable magnitude. M. Mollerat considers that the chemical action by which the copper is revived may be easily accounted for in the following way. The proto-sulphate of copper which unquestionably exist in the solution deposits its base in passing to the state of deuto-sulphate, which gives up its oxygen acid, to form the new salt. It is not therefore this part of the phenomenon that appears particnlarly deserving of notice, but the cohesion acquired by the copper so precipitated from the midst of its solution; a tenacity so great as to admit of the metal being hammered into leaves in the cold state, the specific gravity of which is equal to that of fused copper. *Annales de Chimie.*

To make lacquer for brass of various tints.—Take eight ounces of spirits of wine, and one ounce of arnatto well bruised; mix these in a bottle by themselves. Then take one ounce of gamboge, and mix it in like manner with the same quantity of spirits, and bruised saffron steeped in spirits to nearly the same proportion.

Take seed-lac-varnish what quantity you please, and brighten it to your mind by the above mixtures. If it be too yellow, add a little more from the arnatto bottle; if it be too red, add a little more from the gamboge or saffron bottle; if too strong, add spirits of wine.

To make Seed-lac-Varnish.—Take spirits of wine one quart; put it in a wide-mouthed bottle, and add thereto eight ounces of seed-lac, which should be large grained, bright and clear, free from sticks and dirt; let it stand two days, or longer, in a warm place, often shaking it. Strain it through flannel into another bottle, and it is fit for use.

Egyptian Mummies.—Dr. Granville has ascertained that common bees' wax is the preserving ingredient in Egyptian mummies, and that the effect is produced simply by a thorough impregnation of every part of the subject. Gum, myrrh, raisins, bitumens, &c. were likewise employed by the Egyptians, but none of these either singly or jointly appear to possess the necessary preservative qualities. To prove that bees wax was the essential ingredient, several experiments have been made upon the mummy lately brought from Egypt by Sir A. Edmonstone, a portion of which being deprived of the wax, immediately began to putrify; and the wax being subsequently intro-

duced, not only the putrefactive process was thereby immediately stopped, but it had all the appearance of a freshly prepared subject.

Boiling point of fluids.—Some experiments have been recently made by which it appears that the boiling point of water and other fluids is by no means so uniform under equal degrees of pressure as has been generally supposed; and it seems to be established that the introduction of any solid matter, such as chips of wood, filings of metal and bits of glass into the heated liquor will cause it to boil up immediately and discharge vapour copiously, at a lower temperature than it otherwise would have done. It is said that something of this kind has been done for some time past by the keepers of steam engines for accelerating and augmenting the disengagement of vapour. The circumstance has, however, but recently been made public; it has notwithstanding already been applied to the purpose of distillation, and by Professor Oersted in particular, (as mentioned in our last number) who found himself able in consequence of this addition to the liquid to distil three sevenths more of spirit in a given time, than he could without it.

Improvement in Penknives.—It is a common fault in penknife blades, that the angle which forms the edge is too obtuse, owing to which the blade is sometimes driven nearly across the quill. To remedy this defect, Mr. Clark, of Exeter Change, has introduced one of an improved form, in which the line of the edge is on the same plane as one of the sides of the blade, and forming a very acute angle with the other. This instrument may in consequence be more easily governed, and a pen formed by it with greater nicety.

Exposure of Iron to air on the top of St. Paul's Cathedral, *(From a Correspondent.)*—"I observe in your 47th number, that a fact has been noticed respecting the preservation from rust of an iron cross on the summit of Monte Rosa, the height of which is calculated at 14,686 feet. I have to inform you that I remarked about twelve years since that iron exposed to the elements does not rust in situations much less elevated. At that time I had some country friends who came up to London, and being myself a resident of Cockaigne, the task of "shewing the lions," and all the wonders of this big "wen," (as Cobbett facetiously calls it,) devolved upon me. Amongst the rest of the sights we went to have a look out of the ball of St. Paul's, and in passing up into it between the vertical iron bars which supported the ball and cross, I could not avoid remarking (being by the bye a blacksmith) that the said iron bars looked as clean, and as free from rust, as if they had been only forged an hour before; not a particle of rust could I discover, and the blows of the hammer were all as distinct as newly forged work, notwithstanding they had been exposed to the wind, and rain, and snow, and frost, in that situation for a long series of years. I enquired of the guide, or shewman, on the subject, who being neither a chemist nor a philosopher, told me, that all he knew was, that the bars did not rust, and that nothing was ever done to them to prevent it. I for a moment thought that this state of metal might be owing

to a thin coating of grease derived from the hands and clothes of persons passing between the bars, but on examining those parts of the iron out of reach of all such contact, there was no oxidation whatever to be discovered. Being myself of the plebeian order, and having no acquaintance among the learned or scientific, I have hitherto in vain sought for an explanation of this phenomenon, and I now make bold, Mr. Editor, to appeal to you on the subject, requesting the favour of your having the above observations placed among your interesting miscellanies, in the hope of seeing, ere long, an exposition of the cause of so singular an effect. H. L."

LIST OF NEW PATENTS.

DISTILLATION.—To J. J. Saintmarc, of Wandsworth, Surry, for improvements in distillation. 28th June. Six months.

BUILDING SHIPS, &c.—To David Redmund, of Old Street Road, for improvements in building ships, houses, &c. 28th June. Six months.

SADDLES.—To George Thompson, of Wolverhampton, for an improved construction of saddles. 28th June. Six months.

SILK.—To John Heathcoat, of Tiverton, for improvements in manufacturing thrown silk. 6th July. Six months.

DRESSING OF CLOTH.—To William Heycock, of Leeds, for improvements in machinery for dressing cloth. 8th July. Six months.

ROAD-MAKING.—To John Biddle, of Dormington, Salop, for machinery for making, repairing, and cleansing roads, paths, &c. 8th July. Six months.

RIGGING OF SHIPS.—To Lieutenant Molyneaux Shieldham, of Wrangford, Suffolk, for improvements in setting, working, reefing, and furling the sails of vessels. 8th July. Two months.

SALT-WORKS.—To William Furnival, and John Craig, of Anderton, Cheshire, for improvements in the manufacturing of salt. 8th July. Six months.

LACE.—To John Day, and Samuel Hall, of Nottingham, for their improvement in a pusher twist, or bobbin-net machine. 8th July. Two months.

WATER PIPES.—To Walter Hancock, of King Street, Northampton Square, for improvements in the making of pipes for the passage of fluids. 16th July. Six months.

CARDING WOOL.—To William and Henry Hurst, of Leeds, for improvements in scribbling or carding of sheep's wool. 16th July. Six months.

LOOMS.—To Henry Hurst, and George Bradley, of Leeds, for improvements in looms for the weaving of woollen cloth. 16th July. Six months.

TO READERS AND CORRESPONDENTS.

Our next number will contain, in addition to the usual variety of mechanical inventions and scientific discoveries, a description of some very extraordinary machinery, of great public interest and utility, which will be illustrated with large engravings on copper or steel.

Some account of the apparatus alluded to by W. R. will probably appear in our next.

We have received several Letters upon going to press which will receive the earliest notice.

D. N——N and H. L. are not forgot.

Vulcan's Stove, for the combustion of Steam in Dwelling-houses is being engraved.

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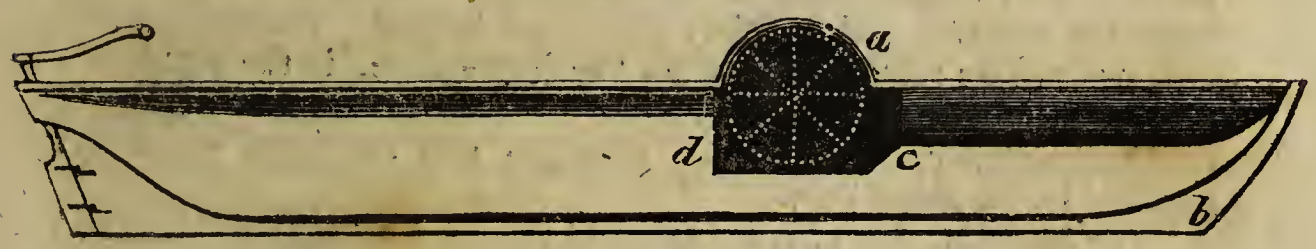
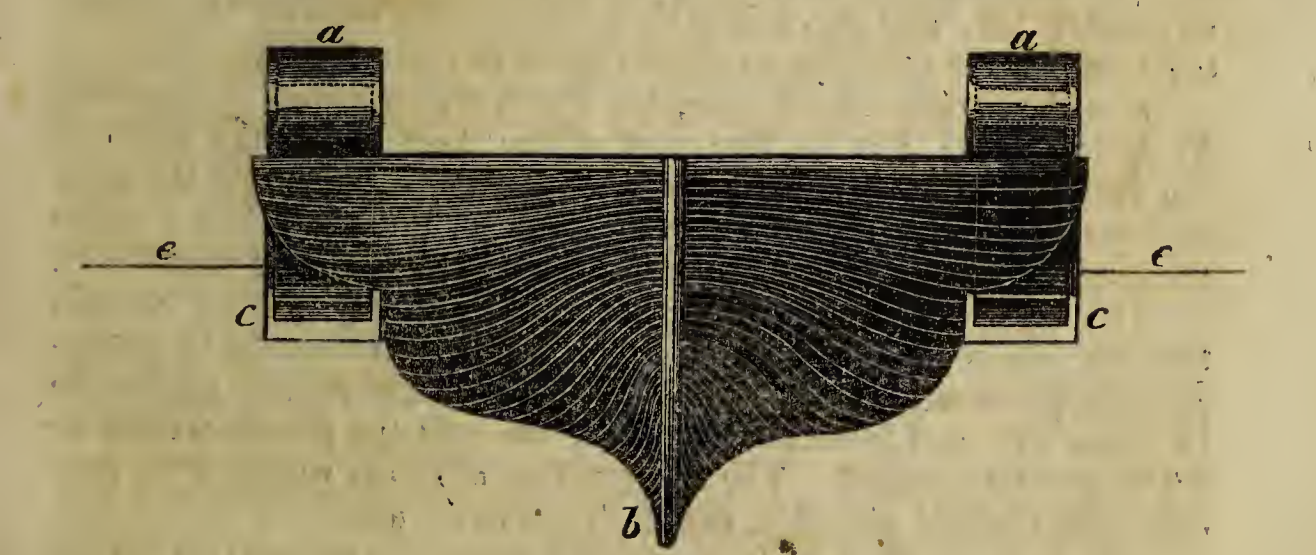
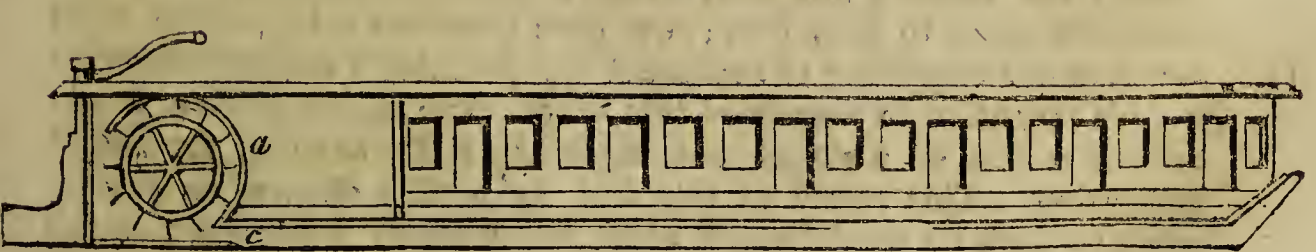
CONTENTS:

Gordon's Patent Steam Boats - - - - - 33
Dickenson's Patent Air Chambers for Life Boats, &c. - - - - - - - - - - - 36
Thompson's Patent Process for making Cast Steel - - - - - - - - - - - - - 38
On the Generation of Steam at Sea - - - ib.
Hawkes's Patent Capstan - - - - - - - 39
New fermenting Machine for Bread Dough ib.
Cheap Mangle and Copying Machine - - 40
Saintmarc's Patent Apparatus (continued) ib.
Mr. Gilman's Letter on the Decomposition and Combustion of Steam - - - - - 42
Mr. Nevill's Letter on the same - - - - 44
On restoring the Black Colour of pale Ink 45
Proposal for a new Scientific Journal - - ib.
MISCELLANEOUS. Adulteration of Sugar, 47—Green Fruit in Winter, ib.—Silk Throwing, ib.—Motion of the Solar Spots, ib.—Insensibility of the Retina of the Eye, ib.—Canals, 48—Patents, Correspondence, &c.







GORDON'S PATENT STEAM BOATS.

THE superior convenience and advantages attending the navigating of vessels by steam, over the ordinary means of propulsion, (more especially in all coasting and inland navigation) render every im-

provement in their construction an object of deep interest and curiosity; we therefore willingly accede to the desire expressed by our correspondent, Nauticus, (see page) in presenting to our readers an account of Mr. Gordon's Patent for Improvements in Steam and other Vessels.

These improvements are comprised under several distinct heads; the first of them appears to be of a very decided character, and it is the more important and valuable on account of its extreme simplicity.

The patentee proposes to enclose the ordinary paddle wheels in a *case*, in such a manner that the edges of the paddles of the wheel have only just liberty to move freely between the sides of the case; in front (i. e. towards the bow of the vessel) the water enters at an aperture in the case entirely below the level of the water line, which having been operated upon by the paddle wheels, escapes freely at the back, the case being left quite open in that part for the purpose. By this method of inclosing the paddle wheels it is considered that they will act with much more effect and propel a vessel faster as the water cannot escape either sideways or downwards, but is forced to enter the aperture and be fairly driven out behind. Another advantage derived by this casing, of no less importance, is the protection it affords the paddle wheels from the violence of the waves, which not unfrequently causes serious damages and accidents when left exposed in the usual way.

The diagram, *fig.* 1, is intended to exhibit a side view of a vessel so constructed, and *fig.* 2 is a view towards the head of the vessel; the same letters referring to similar parts in each of the figures.

a is the paddle-wheel case, the wheel within being represented by dotted lines; *b* is the fore part of the keel under the bows of the vessel; *c* is the aperture for the water to enter, and *d* the open back part of the case for the water to escape; the dotted line *e* shews the level of the water line above the apertures *c c*, before mentioned.

The specification describes several differently formed vessels both for inland and sea navigation, and shews by reference to accompanying plans and sections, that the invention is equally applicable to them all, and in whatever part of the hull the paddle-wheels or *wheel* may be situated. The construction of steam vessels with only one paddle-wheel placed at the stern and in the middle of its breadth, though not entirely new (nor claimed under this patent) is too remarkable for us to pass over; we have therefore selected the third figure in our engraving to represent the patentee's method of applying his invention to vessels of this kind. The figure gives a longitudinal section of a steam-boat, more especially adapted for inland navigation. This vessel is intended to have a channel or course, made through its whole length along the bottom, being open on the under side (like an inverted trough) until it comes to the part where the paddle-wheel case commences; and there the channel is closed up under the paddles, so as nearly to touch their extremities as they revolve. It is likewise intended that this vessel shall be steered by two rudders, placed one on each side of the paddle-wheel, and connected together by jointed rods so as to be moved by one

lever or tiller. The paddle-wheel in its case is shewn at *a*; the aperture for the entrance of the water at the end of the long channel at *c*, which escapes freely at the back, as the rudders being placed at the sides of the stern offer no obstruction.

The aperture for admitting the water to the paddle-wheel, the patentee recommends to be furnished with a sluice or shutter, so that the water may be supplied in greater or less quantity by increasing or diminishing the aperture, according to the velocity of the wheel, or to the roughness of the water in which the vessel is navigated. It is also recommended that the said aperture shall be protected by flat bars of metal placed edgeways, so as to form an upright grating to prevent any floating substances from driving against the paddle-wheels, and at the same time not to prevent the free entrance of the water.

The patent likewise embraces several other improvements to navigable vessels of a totally novel and apparently useful description; which being given very concisely in the enrolled specification, we shall avail ourselves of them by adding the following verbatim copy.

"The second of my improvements is applicable to sailing vessels as well as to steam packets, being for the purpose of keeping a vessel perpendicular in the water, (or upon an even keel, as it is termed by seamen.) It consists in employing a vessel or tank, or a number of vessels or tanks, to be suspended over the weather side of the ship at a considerable distance from the side. The said vessels or tanks I propose should be suspended in such manner as to be capable of being lowered down into the sea, and thereby filled with water, and then drawn up so as to operate by their weight to counteract the effect of the wind upon the vessel, and keep her always upon an even keel, or nearly so, which is of very great importance, particularly in vessels or packets to be propelled by steam, in order that the paddle wheels may act equally in the water on both sides of the vessel. The vessels or tanks above mentioned may be made of wrought iron plate, or tarred canvas, distended by a hoop or hoops, or any other suitable material, and be furnished with a guy rope at bottom, for the purpose of turning out the water to empty the vessels or tanks: when the use of the weight becomes no longer necessary, they may be suspended from the ends of looms or davits over the ship's side, or from turning jibs similar to a crane, so as to be capable of being turned in, close against the side of the ship when not in use. One set of the above-mentioned vessels or tanks would serve for both sides of the ship, as they seldom could be required on both sides at one time. By means of these vessels or tanks, the ship might not only be kept nearly on an even keel, but also be easily trimmed, and carry additional ballast at the very time it might be wanted, without being encumbered with it constantly.

"The third of my improvements, which is applicable to steam packets and other vessels, is as follows: I propose to surround the ship or vessel at about the height of the gunwale with a chevaux-de-frise, or line of railing, which is to be very thickly set with pikes (like a hedge-hog's back;) and to prevent any accident from objects

falling upon the sharp points, iron rods and an iron nutting might be placed round the chevaux-de-frise. This chevaux-de-frise, or assemblage of pikes, might be made in a number of separate pieces, so as to be bolted, or otherwise fixed on the outside of the ship when it went to sea. By this means no serious injury would be done by large waves coming on board a vessel, or the ship would not be in danger of being pooped, although no dead lights were employed; at the same time it would be a sufficient protection to cabin windows, for it is only when water is kept in a compact body that it is so very powerful; the instant that its particles are separated and intermixed with air, which is a compressible substance, its great power is destroyed. The principle here mentioned may be applied to an immense variety of naval improvements.

"I do not confine myself to any particular mode of affixing, or enclosing the chevaux-de-frise, or assemblage of pikes, but intend to claim generally the use of a chevaux-de-frise, or other similarly constituted fence, applied to vessels for the purpose of separating the particles of water, and thereby protecting the whole, or any part of a ship, from the violence of the waves. It is this third part of my improvements which I consider applicable to other naval and marine purposes, and with that intention I propose that a triangular or other shaped frame of wood, and which in some cases may be constructed with the spars of a ship, shall be fitted with a chevaux-de-frise, or system of pikes very thickly set upon the frame, presenting a surface (like a hedge-hog's back) as above-mentioned, and that the frame thus prepared shall be made use of to float upon the surface of the water, in order to protect a ship when at anchor, when lying to, or even when scudding through a very heavy sea. In the two first instances I recommend that the floating fence should be anchored at a sufficient distance from the bow of a ship; and, in the third instance, by being towed by a cable at a sufficient distance from the stern, to prevent any accident from the waves throwing it against the ship. I also propose to adapt and affix a similar chevaux-de-frise to a floating breakwater, and in this way I am convinced that a safe harbour might be made in any place where the sea was not too deep, and where the breakwater could be anchored securely. I do not hereby claim the invention of floating breakwaters, but only the application of the chevaux-de-frise, or system of pikes, (arranged as aforesaid) to floating breakwaters."

DICKENSON'S PATENT AIR-CHAMBERS FOR LIFE BOATS, &c.

The intention of the patentee of this invention seems to have been chiefly the construction of ships and boats of iron and other metal, and the rendering of them buoyant even when filled with water. It is proposed that a hollow chamber should be formed round the interior of the sides of the vessel, into which are to be closely packed a number of impervious bags filled with air, properly secured from external injury in various ways; but chiefly by inclosing a

number of small vessels within a larger, so that if the exterior should get rent by accident, the interior may remain entire. The interior vessels may be made with water-proof bags, animal bladders, oil skin, the œsophagus of cattle (wezands), which may be either inflated with air, filled with cork shavings, or similar light substances. The exterior casing, or chamber, may be made of wrought metal or other strong material rendered impervious to air and water, by a coating of cloth, canvas, &c. saturated with paint, oil, varnish cement, or other waterproof composition.

The patentee's claim extends to the employment of these air-vessels in every way, and to every purpose in which they may advantageously be employed; but he has described in his specification several of their most obvious and important uses, which are as follow.

Such metallic buoys as are rendered buoyant by air, may be much improved by introducing these secondary air-vessels inside them, by which their buoyancy would be preserved in case of external injury. Buoys may likewise be made of cloth, and be very serviceable and of great strength, upon this improved plan, by first filling them with small air vessels as before mentioned, and then saturating the external covering with cement or some durable impervious composition; the seams to be covered over with strips of cloth cemented down, and the ends with caps of metal.

The patentee proposes also to fill beds, bolsters, pillows, cushions, the seats of chairs, sofas, carriages, saddles, &c. with his small improved air chambers as before described, instead of the materials generally used to stuff or fill them. For these purposes, small bladders or oil-skin bags, will be inflated with air and crammed into flexible cases, duly prepared with any of the well-known air and waterproof compositions. In the same manner collars and bandages may be formed as life-preservers to prevent persons from being drowned.

We have already mentioned the chief object the patentee had in view by this invention, viz. the construction of life boats and also life *ships*, (the apparatus being equally applicable to the smallest boat and largest ship). Supposing a ship, barge, or boat to be made of iron; a hollow space or chamber is to be constructed all round the interior of that part of the sides called the gunwale, which is to be filled with small air vessels as before mentioned; the external chamber is then to be closed air tight by rivetting the joints, and covering them with cloth or canvas, attached to the surface by means of some impervious cement, or composition, such as a solution of caoutchouc, resin, and Venice turpentine, prepared in the usual way, with which the cloth may be thoroughly saturated, and then pressed upon the iron, so as to adhere closely, and permanently stop up every interstice. In the same manner the spaces between the thwarts, and other parts of the hull of a ship or boat, may be crammed with these improved air chambers, when the buoyancy of the vessel would be preserved, in spite of numerous fractures and fissures made in the hull, and external air vessels.

We understand that Mr. Dickenson (of Park Street, Southwark,)

the patentee, has already constructed a life boat, and some models of other vessels on these excellent principles; and from the masterly manner in which the inventions of that gentleman are always executed, it is probable that the public will have the satisfaction of seeing this new invention, (so well calculated for the saving of human lives as well as property) brought into successful use.

THOMPSON'S PATENT FOR PREPARING REFINED CAST STEEL.

The patentee, (Mr. John Thompson, of Pembroke Place, Pimlico) proposes, in the first place, to employ reverberating, or what is commonly called *puddling* furnaces, for melting the metal, instead of the upright furnaces generally used for that purpose; by which pit-coal may be burned instead of coke. Secondly, instead of the ordinary crucibles which are taken from the furnace to pour out the fluid metal, semi-cylindrical vessels two feet nine inches long, and twelve inches broad, are to be *fixed* in the furnace, slightly inclining from the horizontal line for the convenience of discharging their contents. The material of which these troughs are to be made is Stourbridge clay or firestone, about an inch and a half thick; they are formed with spherical ends, with a rebate or groove in the upper edges to receive and fit a cover of the same shape and material.

At the bottom of each of these vessels a small hole is made, into which is inserted a tube of platina, and to this is connected another tube made of fire-clay, passing through the brick work to the outside of the furnace, through which the metal flows into moulds, placed conveniently for that purpose, the apertures having been previously stopped with clay, and tapped by means of a long rod tipped with platina.

PROPOSITION FOR GENERATING STEAM BY MEANS OF LARGE BURNING GLASSES.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"Sir,

"It appears by the public journals that a steam vessel has sailed for the East Indies. In such long voyages, the quantity of fuel required greatly limits their usefulness. In the equinoctial regions, could not steam be produced by powerful Burning Glasses, acting upon a pipe containing water? I by no means wish to be understood that the engine could be worked altogether by these means, but only to be used to save fuel, when circumstances are favourable for their employment. Archimedes set fire to the enemy's fleet with a large reflecting mirror; how much easier then, in this boasted day of science to procure steam by large Burning Glasses, when there is no enemy to oppose us. I hope this hint will induce some one to make the experiment, and that it may prove successful.

"*August* 15*th*, 1825. "SAM^{L}. N. B."

PERSONAL DANGER ATTENDING THE USE OF THE COMMON SHIP'S CAPSTAN.

"I AM, Sir, one of those amphibious creatures, ycleped a sea *man*, and being also one of the few among my species who have learned to read, I take in your Register regularly; finding, moreover, that a considerable portion of its pages are devoted to the mechanical arrangement of navigable vessels.

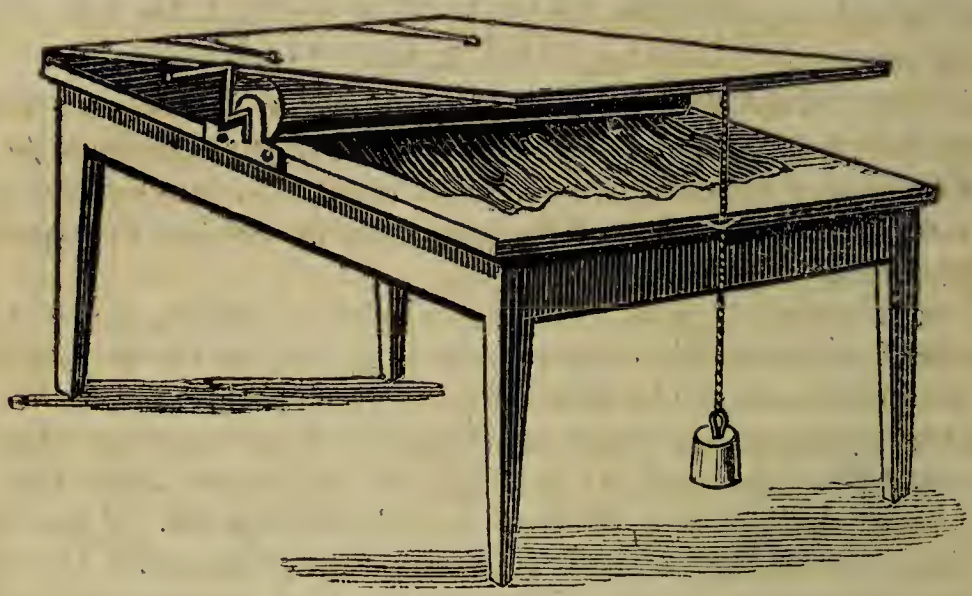
"The description of Mr. Hawkes's Patent Capstan, given in your last number, and the very clear manner in which you shewed its superiority over the common machine, gave me particular satisfaction. But there is one very essential point, to which I wish to draw your attention, as you omitted all notice of it; namely, the serious accidents that frequently occur by the use of bars to the old capstan. I can speak *feelingly* on the subject myself, being now suffering under the effects of a severe contusion, given by one of the bars, upon a surge of the capstan; and I dare say it will be fresh in the recollection of many of your readers that the captain of the Medina (belonging to Hayman and Co., of Limehouse) was *struck dead* by one of these —— —— bars. I could mention several fatal disasters by this barbarous mode of applying power, were it necessary to convince any person of common sense, of the danger and inefficiency of the old machines. The noise and confusion attendant upon the old plan are also great inconveniences, joined to which, must be mentioned, the occupation of the whole breadth of the deck, frequently to the entire prevention of other operations. By Mr. Hawkes's plan, the two sides of the deck will be left clear, either for working the ship, or for the parade of the officers.

"*Deptford*, "NAUTICUS."
,, 15 *August*, 1825.

"P. S. Some account of Mr. Gordon's patent improvements to steam vessels, will be very acceptable to many of your readers, and to none more than myself. N.

A MACHINE FOR ACCELERATING THE FERMENTATION OF DOUGH,

HAS been invented at Lausanne, in Switzerland. It consists simply of a round box of fine wood, a foot in diameter, and two feet long, placed upon gudgeons, and put into motion by a winch, resembling exactly the cylinder used for roasting of coffee. An opening is made on one side for receiving the dough. The time necessary for the fermentation depends on the temperature, the rapidity of its motion, and many other circumstances; but when the paste is properly raised, the operator discovers it by the hissing sound of the fixed air, as it rushes out of the machine. It never fails to work well, and requires at most half an hour's attention. The labour is trifling, as a child can turn the machine. If made longer and divided into compartments, it would serve for the preparations of several kinds of paste at the same time. This machine offers the double advantage of raising paste expeditiously and to the exact degree required. *Rev. Ency.*



CHEAP MANGLE AND COPYING MACHINE

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"I BEG to offer a sketch of a simple apparatus upon the same principle as the copying press in your 46th number, which answers the purpose of a *Mangle*. It consists of a roller, about four inches in diameter, and thirty inches long, with a piece of the thick woollen cloth used for ironing upon, firmly fixed thereon, which is held upon a table by two strong iron plates, and turned round by means of a winch; upon this rests a board, the length and width of the table, secured to it at one end with hinges, and with a weight suspended from it at the other, the pressure of which, upon turning the winch, winds the woollen cloth, and the damp linen articles laid upon it, so tight upon the roller, that by continuing the motion, the linen becomes as smooth as by the common unwieldy mangle. The roller rests upon the table, and the iron plates allow it to rise or fall, according to the quantity of clothes wrapped round it.

"I remain, Sir,

"*Charlotte Street,* "Your most obedient Servant,

"18*th, August,* 1825. "W. H. PITCHER."

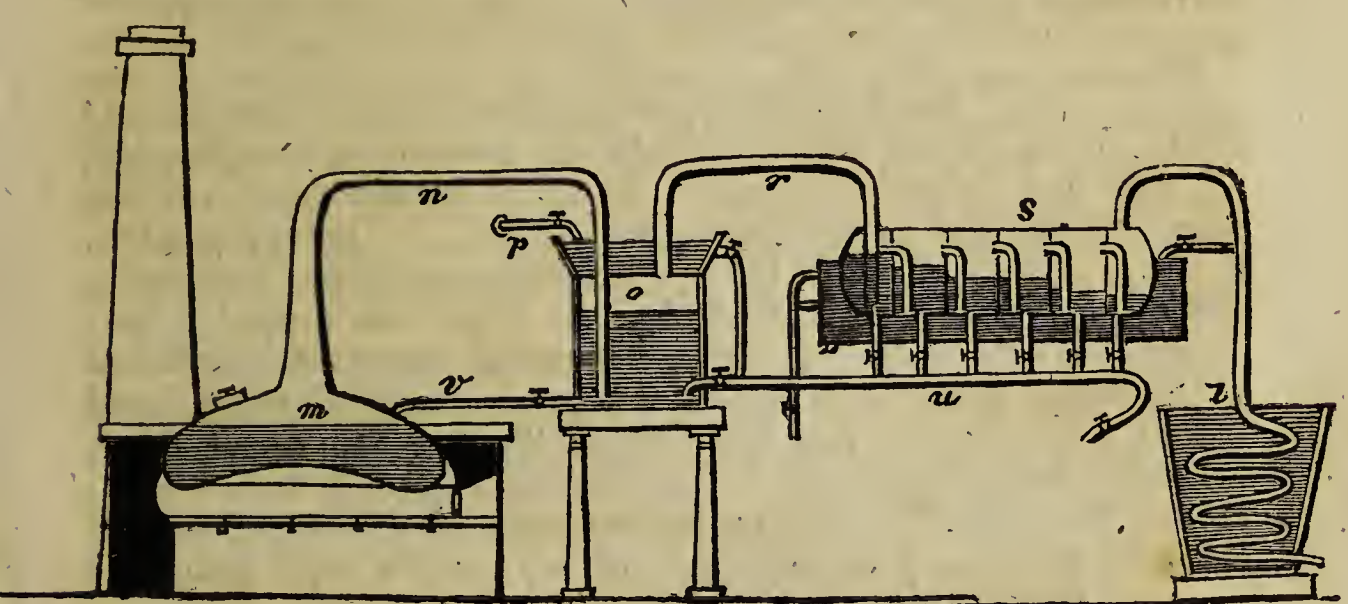
SAINTMARC'S PATENT APPARATUS.

(Continued from page 27.)

IN our last we gave an account of the principal part of the apparatus employed under this patent for the distillation of spirit from potatoes, and we left off in that part of the process wherein the wash had undergone *one* distillation, producing thereby that diluted spirit technically termed *low-wines*. It matters not whether the low-wines be obtained from potatoes or other vegetables, or any kind of fruit, the product being the same in all, excepting a slight variation of flavour. These low-wines undergo usually several subsequent distillations, in a still of smaller capacity than that previously used; and,

lastly, a rectification, before the spirit is brought to the required degree of strength and purity.

The still we have now to describe is called by the patentee his *low-wine still*, and its several parts are very judiciously adapted for conducting the subsequent process with great despatch and convenience. *m* is the body of the still fixed in brick-work over a furnace; a long perpendicular neck proceeds from this as in the former instance, the object of which is, that the aqueous part of the vapour may be condensed as it ascends and fall back again, while the more volatile and spirituous passes on through the tube *n* to the bottom of the vessel *o*. This last-mentioned vessel has a tub of cold water placed on the top of it, which is kept supplied by the service-pipe *p*; and as the tube *n* passes through this tub, the greater part of the vapour in the tube *at first* condenses, and is received into the vessel *o* in a liquid form; but as the vapour is continually coming over from the still, the condensed liquid is at length made to boil; the vapour filling the upper part of the vessel, from thence passes up the tube *r* into the long cylindrical vessel *s*, which is partly immersed in a large cistern constantly supplied with cold water by the usual means. The cylindrical vessel *s* is divided by five vertical partitions into six compartments, but having a communication from one to the other by means of bent tubes, proceeding from the upper part of the first compartment to the lower part of the second; and in the same manner from the second to the third, the third to the fourth, and so on.



It will now be readily seen that the most aqueous portion of the vapour will be condensed in the first compartment, while the more volatile passes into the second, where another portion of the vapour assumes a liquid form; the more volatile still will proceed to the third, and from thence to the fourth, fifth, and sixth, according as the spirit is more or less divested of aqueous particles, all depending, of course, upon the degree of heat employed in the furnace for raising the vapour in the still *m*, and to the degree of coldness of the water surrounding the condensing vsssels. To ensure, however, the condensation of all the vapour a tube *g* proceeds from the upper part of the sixth com-

partment, rises to a considerable height, then takes a horizontal course, and finally descends into a spiral worm placed in a tub of cold water, where making a long circuitous passage it is delivered from the bottom into a receiver in so concentrated a form as to be nearly in the state of pure alcohol.

At the bottom of the cylindrical vessel *s*, a separate short pipe with a cock proceeds from each compartment leading into the long pipe *u*, which being also furnished with a cock at either end, the spirit contained in any compartment may be drawn off distinctly; the contents of any or all the compartments may likewise be drawn off by the pipe *u* into the vessel *o* for re-distillation; and the vessel *o* may be discharged back into the still, when desired by means of the pipe *v*, having a cock for that purpose. Thus this very excellent arrangement and connexion of the several vessels admits of the repetition of the processes with the utmost facility and convenience. Having said thus much in favour of this cleverly contrived apparatus, we may be allowed to mention what strikes us as a very remarkable defect, viz: the employment of *naked* fire (as it is termed) to this still, instead of the water bath, and the consequent necessity of the long perpendicular head to it, which is at best but a partial remedy for the evils engendered by the direct application of fire to the bottom of the still.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"NOTHING can be more correct, than the observations of Mr. Evans, on the power of claiming, previous to specification, any new and valuable invention, should it be connected with the same subject; such power extends, more or less, to all patents granted, as the superscriptions are, I believe, without exception, necessarily general and indefinite. The one I drew, being considered too particular, was actually altered, and the alteration suggested and effected at the Patent Office to its present "*vague and indefinite terms,*" and I think nearly twenty may be found on the subject of steam alone, taken out under the head of "*certain improvements,*" so that, I trust, neither Mr. Evans, nor the public, for whom he claims justice, will consider, that the "*vague terms*" of my patents were purposely designed from any unworthy motive.

"I am as incapable, as any man, of taking so mean and disreputable an advantage; and I must confess, that however ardently I may have contemplated this improvement, I should not have had the courage to have made the claim, if the knowledge of it had been confined entirely to myself. I am, therefore, much obliged to that gentleman, in his having given me an opportunity to justify a demand that must, I am aware, *under these peculiar circumstances,* carry with it great suspicion, and which would, deservedly, attach to any person, unjustly making it, disgrace and obloquy.

"I have been accustomed to spend most of my available time from

my earliest years in scientific pursuits, and for a considerable period, devoted much of that time to the subject of steam, its production, application, decomposition, &c., during which, my investigations have led me to be long acquainted with this important fact, and its simplicity: now, when every mind is expanding by the genial influence of science, has excited a constant expectation of hearing of such an obvious application, more especially, as I have been repeatedly questioned, whether steam of great elasticity and high temperature, would not burn. That such an improvement has not before been effected, I can only attribute to the want of combining with the idea, the knowledge of chemistry, otherwise, it seems unaccountable how so palpable and simple a thing, should have been so long overlooked, rather than it should afford matter of surprise, that two persons had been pursuing the same object.

"Mr. Evans is, I believe, a patentee, therefore must be aware, when the object of a patent is in view, of the secrecy necessary to be observed in experimenting; hence the difficulties that oftentimes arise in procuring the necessary proof: but I have, Mr. Editor, furnished you with affidavits, which, I trust, will be sufficiently satisfactory, and which you may publish or comment on, as you think proper: more I could send if needful, but I consider it unnecessary.

"I must remark upon that passage of Mr. Evan's letter, wherein he says, "*I consider that the principle was well known to the chemical world, and I therefore did not think proper to endeavour to secure to myself an exclusive privilege;*" that, determination undoubtedly rested entirely with himself. Now, sir, his *reason* for so doing namely, because "the principle is well known to the chemical world," appears to me nearly as weighty, as the shadow of a shade; for this application is undeniably new, and as important, as new, and therefore, if such objections were good, the same might be made to every improvement that is a modification of the same *principle*, so that no person would be entitled to the privilege, but the absolute inventor of a *principle*.

"With regard to Mr. Evans' concluding paragraph, I may observe, that if neither he, nor the public, have heard of my making this discovery, neither have they of the other improvements, that are the subjects of this patent; and I assure that gentleman, that the saving of fuel obtained by the combustion of the hydrogen, is very trivial to that which is gained from the other discoveries. There are many reasons which prevented the promulgation, one of which is, that until very recently there was a patent to specify; and therefore it could not, on the principle before admitted, be done with safety; moreover, I intend putting a generating apparatus and engine, combining all the improvements, on board a vessel, which may fairly compete with any of the same tonnage on the river, when the comparative merit of the new plan, as to its safety, and the expense of fuel, may be justly drawn; which, in my opinion, will be far more satisfactory to the public, than holding forth high expectations, after the numerous and repeated disappointments that have been experienced.

"I must now take my leave of this subject, having, as I conceive, done all that can be fairly required.

"I am, Sir,

"Your very humble Servant,

"WM. GILMAN."

We have received the Affidavits mentioned in the preceding letter, which we think it unnecessary to have printed at length; our readers will, we trust, be satisfied with our assurance, that they are perfectly regular documents, sworn to before the Lord Mayor, and that they both relate to the same fact, viz.; that Mr. Gilman as far back as the 8th of February last did mention (in confidence, of course) that one of his improvements consisted in "applying the waste steam after passing the working cylinder or cylinders, as an assistant in producing steam, by its combustion with the fuel employed." ED.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"IN your 49th number I perceive there exists a dispute between Mr. Evans and Mr. Gilman, as to the priority of a supposed invention, or a new application of steam, arising from the decomposition of its water when passed through the fuel at a high temperature. I beg to state, that in 1817 I made an experiment at the Bromley Steam Mills, Middlesex, which was similar to the mode now claimed by Mr. Evans: the steam was conveyed from a thirty-six horse boiler by a pipe two inches diameter into the ashpit, to this pipe was attached one of copper, which was perforated with a number of small holes placed in such directions so as to distribute the steam uniformly below the fire-bars, and the main pipe was furnished with a stop-cock for regulating the quantity of steam that was to pass through the fuel, in order to avoid so large an expenditure of steam from the boiler; I afterwards attached my main pipe to the *feed-head*, and the waste feed water was conveyed into the ash-pit; the head of water was sufficient to cause a number of small jets to rush in an horizontal direction the entire length of the fire-bars, and where there was sufficient temperature to create all the steam required, the experiment was tried both on coals and coke, and a number of gentlemen who were present can vouch for the accuracy of this statement. I included this plan in a patent I took out for generating steam in August 1816.—I have since tried the principle under numerous modifications with all the advantages of intense draughts and high temperatures, and I can assure your readers that their advantages now ascribed to it are visionary.

"*New Walk, Shad Thames,*
"8th *August*, 1825.

"JAMES NEVILL."

" *To the Editor of the Register of the Arts and Sciences, &c.*

" SIR,

" I am a subscriber to your ingenious and excellent work, which induces me to take the liberty of making this enquiry: I have a quantity of black ink by me, which is of bad colour; if you could propose any way its black colour may be restored I should feel obliged. And am,

" Sir, yours, &c.

" 113 *Holborn Bars.* " JOHN VAUGHAN."

" 9 *August,* 1825.

We insert the foregoing letter, as the evil complained of not only concerns the writer, but every body else; and as it would be very desirable that some better means of preserving common writing ink should be discovered, than those at present employed. As a point of economy, our advice to Mr. Vaughan would be to throw his pale ink away, for it is very probable that the mucilaginous matter introduced into the liquid to keep the black particles suspended, has undergone a fermentation; and the liquid being thereby rendered not sufficiently viscous to support the colouring matter, it has subsided to the bottom of the vessel. If gum or sugar be added to supply the place of that which has been decomposed, fermentation will recommence in a short time, and boiling the liquid would perhaps only make it last a little longer. There are, however, numerous other causes by which the change of colour may have been produced, a knowledge of which is necessary previous to attempting a remedy. We are convinced that the making of really good and durable writing ink has yet to be discovered, and we shall be happy to give insertion to the suggestions of our intelligent correspondents on the subject.

PROPOSAL FOR A NEW SCIENTIFIC PERIODICAL PUBLICATION.

" *To the Editor of the Register of the Arts and Sciences, &c.*

" SIR,

" The information you have communicated to the public in your 41st number page 269, must be highly gratifying to every person who is interested in the improvement of mankind in general, and of his countrymen in particular. The establishment of such an institution will realize the anticipation of the French orator, it will " make Science stoop to enter the poor man's door."

" The object I have in view in addressing you, is to direct your attention to an undertaking which I am persuaded would be attended with the most important advantages; and for which no combination of talent would probably be more eligible than that which will be called into operation for the accomplishment of the important objects contemplated in the establishment of the " British Philotechnic Society."

" In the year 1794, the first periodical publication of a scientific cast that was generally accessible, " the Repertory of Arts, &c."

made its appearance. Nicholson's "Journal of Philosophy, &c." commenced in 1797; since that time other works of a similar description have successively been published: and a corresponding increase in the number of Foreign Journals has no doubt taken place. But while knowledge is thus abundantly scattered, the individuals who enjoy the means of access to its various sources are comparatively very few; it may, indeed, be questioned whether all the scientific periodicals meet the eye of *any* individual. To collect these scattered rays of knowledge, and bring the focus within the vision of every enquirer, would, I conceive, be attended with the most beneficial consequences: and in order to accomplish an end so truly desirable, I beg leave, with all deference, to propose, that all *original* papers, memoirs, &c., to whatever branch of knowledge they may refer, that appear in the various Scientific Journals published either in Great Britain or abroad should be reprinted in a *cheap* form, in order that persons of all descriptions, and especially the operative classes, may be put in possession of knowledge to the greatest extent at the least possible expense. If in any case it should be deemed expedient to abridge a memoir, such abridgement should not extend to the omission of any *fact* therein recorded on the ground of its being comparatively unimportant; for though in the estimation of the person employed to prepare an article for publication, some particular fact should appear trivial, yet probably it might be highly interesting to many readers, to whose pursuits it might bear an important relation. To afford purchasers an opportunity of selecting memoirs on subjects connected with those branches of knowledge to which their attention was more particularly directed, the papers might be classed; those, for instance, relating to Chemistry, Mineralogy, Electricity, Magnetism, &c. might be sold together; in the same manner those which treated of Anatomy, Medicine, &c.

"By adopting this arrangement the chemist would not be compelled to purchase astronomical papers; nor the botanist mathematical ones. I am aware it will be objected that such a work would interfere with the existing journals, and occasion a diminution in the sale of them; but I think this would prove a groundless apprehension, as the work I propose might be published once or twice a year only, and few persons who are in the habit of perusing the works of this kind now before the public would like to wait such a length of time for information.

"Much might be said in favour of the undertaking to which I have taken the liberty of directing your attention; but you will anticipate all I can urge in its behalf, and I have already perhaps been sufficiently tedious.

"I am, Sir,

"Your obedient Servant,

"T. L."

MISCELLANEOUS INTELLIGENCE.

Adulteration of Sugar.—Some cases of a fraudulent adulteration of sugar, by intermixing with it a considerable proportion of common salt, have recently been discovered. As a convenient means of detection, it has been recommended by Mr. Clark, of Apothecaries Hall, to place some in a tea-cup, and pour on it a little spirit of wine, which will dissolve the sugar only, leaving the common salt at the bottom.

Green Fruit in Winter.—Let cherries, strawberries, raspberries, plumbs, peaches, or any succulent fruit whatever, be put into a vessel somewhat like that used by common confectioners for freezing ice creams, around which put salt and exactly as they do. The fruit will soon be frozen, when it should be carried to the ice-house, and placed in a hole dug out in the centre of the ice, and over the top of the hole a quantity of powdered charcoal should be placed, secured by a common watchcoat blanket. When the winter arrives, the containing vessel may be opened, and the fruit taken out in its frozen state: then place it in cold water to thaw, and it will be found as delicious as when first gathered. When salt and ice in the manner employed by the confectioners in general, shall be found inadequate to freeze some fruits hard enough, the mixture for producing an intense cold, as spoken of by Chaptal, the celebrated French chemist, of salt, saltpetre, and Glauber salts, will effectually freeze it very hard.—*(From a Correspondent.)*

Silk Throwing.—A very considerable and important improvement has been made in the machinery for Throwing Silk, by a mechanic in the city, of the name of Fanshaw.—We understand that Persons well acquainted with the trade, have declared it as there opinion that it will place our silk trade beyond the reach of the foreign manufacturer, and give that trade the same advantage in point of superiority of machinery that the cotton trade has so long possessed.

Motion of the Solar Spots.—Mr. Emmet has made many observations upon the motion of the solar spots, all of which tend to disprove the opinion, that they are hidden and in sight for equal times, and to support the observations of older astronomers, who state the times of appearance and disappearance to be different. Mr. Emmet makes out the time during which they are visible to be 12d. 8h. 30m. and that during which they are invisible to be nearly 15d. 3h. 30m. *Ann Phil.*

Insensibility of the Retina.—M. Majindie has stated to the Academy of Sciences, that he has ascertained the insensibility of the retina, in the eye of a woman suffering from cataract; no perceptible sensation being produced when the instrument was brought into contact with that organ. The person recovered sight immediately after the operation. *Ann. de Chimie.*

CANALS.—There are 103 canals in Great Britain; the total extent of them is 2682¼ miles; (about the length, from the east to the west of the whole continent of Europe;) thirty millions sterling is the valuation of the cost. In the various canals there are forty-eight subterraneous passages, forty of which have an extent of thirty-two miles. None of these works, important as they are, were projected prior to 1755.

LIST OF NEW PATENTS.

LOOMS.—To T. W. Stansfield, W. Pittchard, and S. Wilkinson of Leeds; for improvements in looms, and in the instruments connected therewith. 16th July. Six months.

HORSE COLLARS.—To T. Musselwhite, of Devizes, for an improved construction of collars for horses and other animals. 16th July. Six months.

NEW MECHANICAL POWER.—To M. I. Brunel, Esq. of Bridge Street, Blackfriars, for certain mechanical arrangements for obtaining powers from certain fluids, and for applying the same to various useful purposes. 16th July. Six months.

SHEARING OF CLOTH.—To T. Sitlinton, of Stanley Mills, Gloucesteeshire, for improved machinery for shearing or cropping woollen cloth. 16th July. Six months.

LAMPS.—To Joseph Farey, Esq. of Lincoln's Inn Fields, for certain improvements in lamps. 16th July. Six months.

LANCETS.—To T. R. Williams, of Norfolk Street, Strand, for an improved lancet. 16th July. Six months.

CARRIAGES.—To T. Gook, of Upper Sussex Place, Kent Road, for improvements in the construction of carriages and harness thereto, whereby greater safety to the persons riding in such carriages, and other advantages will be obtained. 16th July. Six months.

SPINNING.—To J. C. Dyer, of Manchester, for a new invented method of conducting to, and winding upon spools and bobbins, rovings of cotton, flax, wool, or other fibrous substances. 16th July. Six months.

SPINNING.—To W. Hurst and J. Carter, of Leeds, for an apparatus to give a new motion to mules and billies. 16th July. Six months.

TOOTH DRAWING.—To J. P. De la Fons, of George Street, Hanover Square, dentist, for a new instrument for extracting teeth, and for a method of fixing teeth. 16th July. Six months.

PUMPS.—To J. Downton, of Blackwall, for certain improvements in hydraulic machines or pumps. 19th July. Six months.

TO READERS AND CORRESPONDENTS.

The subject which we gave notice of to our readers in our last number, is unavoidably postponed for a month.

S. N. B.'s future communications will be very acceptable.

The "Tipton Mechanic" may rest assured we will do our best to meet his wishes, which, we are persuaded, are those of the public also. One or two of the inventions named will be given in the next number if possible.

W. S.—A. P.—A Seaman—and Mechanicus, are received.

T. H. will find an account of Mr. Perkins's Steam Engine, in No. 24, Vol. I.—The important improvements recently introduced will be described at the earliest opportunity.

We have received several letters just as this number was going to press, which we have not time to notice; excepting that subscribed "A Visitor to your Atmosphere," (sent to us from the Dog-Star) of whom we beg to enquire whether his communication was *really* intended for our work.

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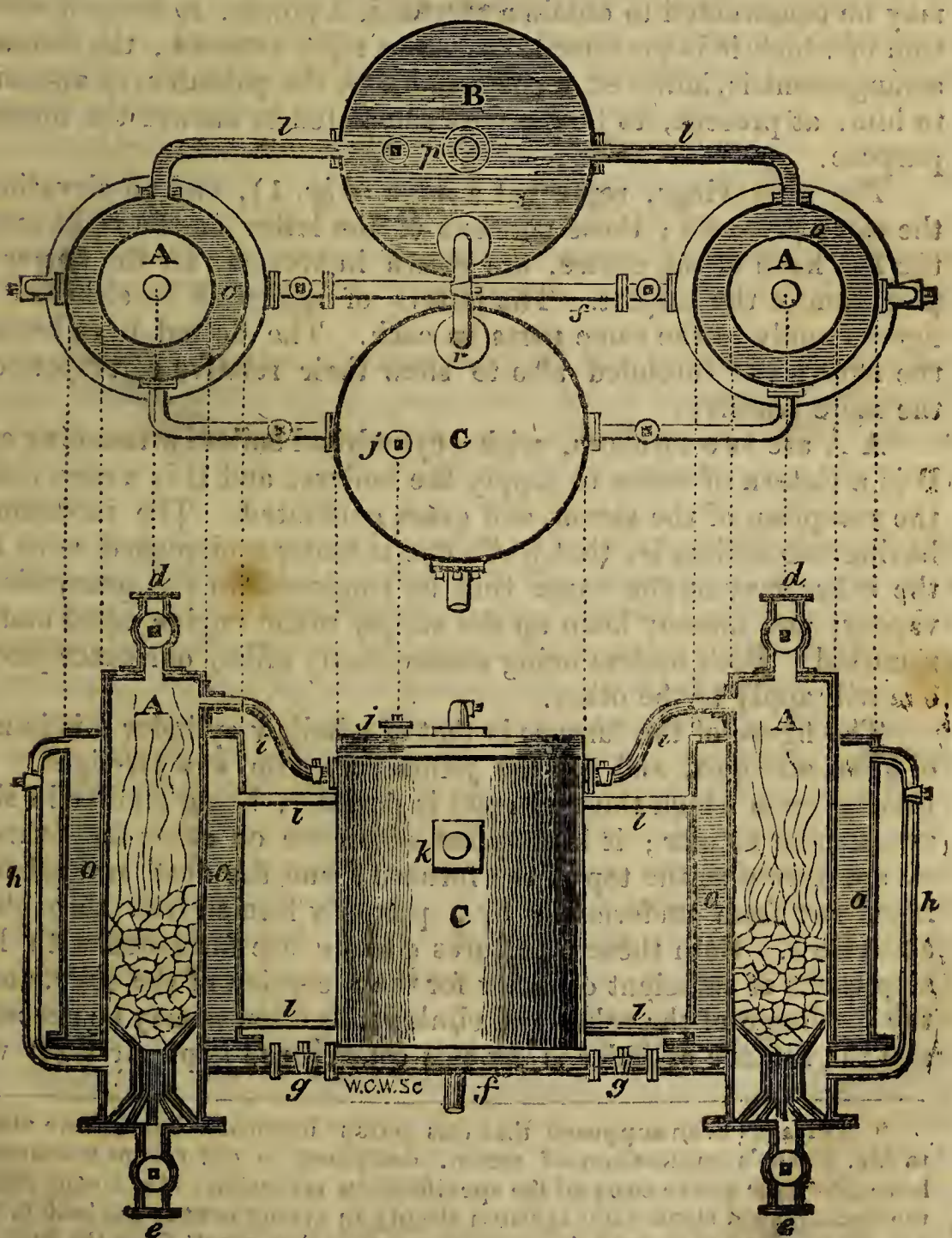
CONTENTS:

Hall's Patent Steam and Gas Engine - - - 50
Cyclop's "Steam Burning" Stove - - - 52
Needham's Patent Method of casting Steel 53
Christie and Co's Patent Coals - - - - 54
Saw Mills - - - - - - - - - - - 55
Todd's Patent Piano fortes - - - - - ib.
Ibbetson on Eccentric Turning - - - - 57
Richman's Patent Fire Escape - - - - 59
MISCELLANEOUS. Bell's Life Preservers, 61—Waterworks at Primrose Hill, ib.—New Pyrophorus, ib.—Identigraphy, ib.—Water Travelling Balloon, ib.—New Machine, 62.—Mexican Mining Pump, ib.—Poisonous Plants, ib.—Sleep of Plants, ib.—Preservation of Wall Fruit, ib.—To revive faded Writing, 63.—To cure Damp Walls, ib.—To destroy Crickets and Beetles, ib.—To make incombustible Paper, ib.—To imitate Oil-Paintings, ib.—Valuable Properties of Chestnut Bark, ib.—Roman Cement, ib.—List of Patents, Correspondence, 64.



HALL's PATENT STEAM AND GAS ENGINE.

HALL'S PATENT STEAM AND GAS ENGINE.

The specification of this patent states that the object of the invention "is to diminish the quantity of fuel used in the generation of vapour for steam engines, even those of the most improved construction, by decomposing the steam in a greater or lesser degree in its passage from the boiler to the cylinder of an engine, under a pressure superior to that of the atmosphere. The gases or elastic fluids thus generated, occupy a greater space at any given pressure and temperature than the steam does, by means of which they are produced; and being for the most part, permanently elastic fluids, they possess the further advantage of being capable of use at a temperature not higher than the atmosphere, if required."*

Founded upon these chemical principles, a variety of apparatus may be constructed to obtain a mechanical power, to every modification of which it is presumed the patent right extends; the following arrangement is, however, recommended by the patentee, as appearing to him, at present, to be the best calculated to answer the intended purpose.

The engravings, represent a plan (*Fig.* 1), and an elevation of the same (*Fig.* 2); those portions of the latter on the right and on the left hand of the centre, are shewn in section, for the better explanation of the subject. The letters of reference in either of the figures apply to the same parts in each. The dotted lines between the figures are intended also to shew their relative correspondence the more readily.

A A are two furnaces, with a cylindrical boiler surrounding each, B is a cistern of water to supply the boilers, and C is a reservoir for the reception of the steam and gases generated. The intention in having two boilers is, that while one is being replenished with fuel, the other may at the same time be employed in the generation of vapour, and thereby keep up the supply to the engine equal and unremitted. Both boilers being consequently alike, our description of one will apply to the other.

The figure of the furnace is that of a hollow cylinder; it is made of great strength, and all the joints very firm and air-tight. The grating upon which the fuel rests is peculiar, being similar in shape to a double hopper; it is supplied with coke or other fuel, through an aperture *d* at the top of the furnace; and the dust and ashes are raked out from underneath by a properly formed iron through the aperture *e*. Both these apertures *d* and *e* are furnished with large stop cocks of sufficient capacity for the reception of the coke, and for the discharge of the ashes and clinkers, as often as may be necessary; and the furnace cylinder is by this contrivance kept air-tight when

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* As it has been supposed that this patent invention bears some analogy to Mr. Evans's application of steam, described in our recent numbers, we have given the above copy of the specification verbatim. Mr. Evans employs the decomposed steam after ignition simply in giving heat to the boiler, while Mr. Hall's plan is to send the gaseous vapours that result from the decomposition into the working cylinder of the engine. Ed.

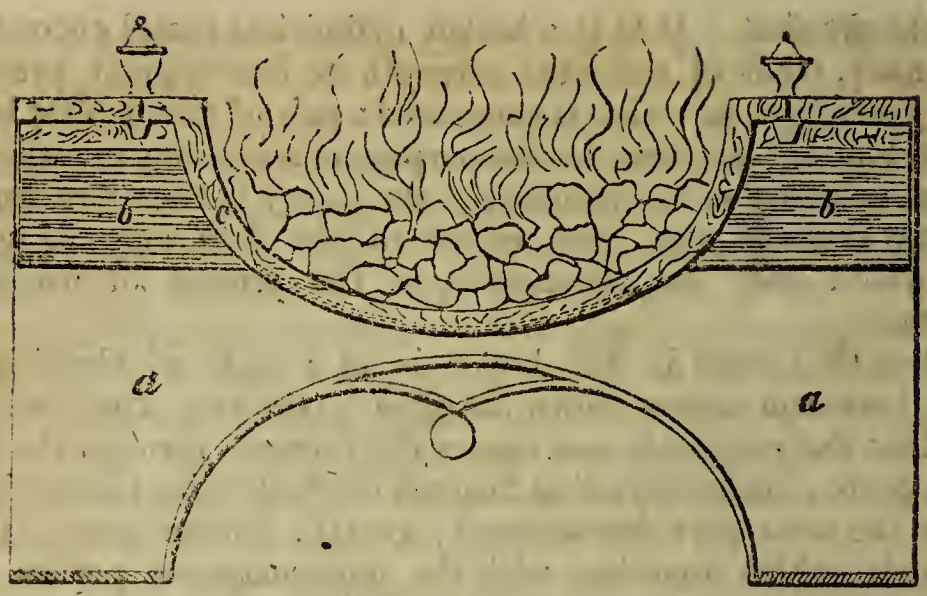
the cocks are shut. O O is a hollow cylindrical vessel encompassing the furnace, made of sufficient strength to bear a great pressure of steam, *f* is a pipe, to which is connected a pair of strong blast bellows, or other blowing machine, for the purpose of increasing or accelerating the heat in either of the furnaces; the pipe *f* is therefore furnished with stop cocks at *g g*, that either of the fires may be operated upon, which they are alternately, in the process of working the apparatus.

When the water in the boiler is in a state of ebullition, the steam therefrom passes down the pipe *h* (the stop cock in it being opened for the purpose), and enters the furnace through the hopper formed grate; there ascending through the fuel under intense ignition it is for the most part decomposed; certain elastic gases are thus generated, which together with the undecomposed portion of the steam proceed along the curved tube *i*, into the strong receiver, or reservoir C. In this vessel it is kept under any required pressure by the safety valve *j*, or other usual means for supplying the working cylinder of the engine by a conducting pipe and cock at *k*.

From the upper and lower parts of the water cistern *b* proceed two horizontal pipes, *l l*, which enter the upper and lower parts of the boilers, preserving the water in both upon the same level, the height of which may be regulated by a float, and a force pump is fixed at *h* for injecting water into the cistern to supply the loss by evaporation.

In order to regulate the pressure of the elastic vapours in the several vessels described, a communication is opened between the reservoir *c* and the cistern *b*, by means of a short bent tube *r*, which is furnished with a stop cock, to cut off that communication whenever required.

In setting this apparatus to work, the cistern and boiler should be filled up to the pipe *l*, as shewn in the engraving; the apertures at the upper and lower part of the furnace opened, when ignited coke or other fuel is to be thrown in through the upper one (*d*); the bellows set to work, and fuel supplied at intervals, until the fire is raised to the proper intensity. When the steam has acquired the right degree of force, which is indicated by the guage, the apertures in the top and bottom of the furnace are closed by their stop cocks, also those in pipes *f* and *r* (supposed to be previously open); the valve or cock in the tube *i* is then opened, along which the steam and gases pass into the reservoir or chamber *c*, and from thence to the engine. When the vapour has continued to pass through the furnace for a certain time, the fire becomes incapable of decomposing a further quantity; the communication with the reservoir C is therefore closed, and the fire replenished by additional fuel and the aid of the bellows; while this is going forward in one of the furnaces, the other is proceeding uninterruptedly in the generation of steam and gaseous vapour in the same manner as that already described: the pressure in the reservoir is thus by the alternate working of the two boilers kept under an uniform pressure, and the supply from thence to the engine rendered equable and unremitting.



DESIGN FOR A STEAM-BURNING STOVE.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"AMONG the numerous valuable inventions contained in your excellent work, I am disposed to think that there are few, if any, of greater importance in a domestic point of view than that of Mr. Richard Evans, of Bread Street, described in your 46th and 49th numbers; as it will probably lead to the getting entirely rid of that greatest of all nuisances of our large towns, *dense black smoke;* and it appears to me, that for the application which that gentleman has already made of the invention to steam-engines, he is fully entitled to the reward offered by the Society of Arts; and to the gratitude of the public at large, for not having availed himself of a patent-right, by which he might have obtained in a short time an immense fortune.

"In the last mentioned number (above referred to) I perceive that your Correspondent, "A CONSTANT READER," proposes a very obvious application of Mr. Evans's discovery, namely, the construction of common household stoves for the decomposition and combustion of steam or water; and I was sorry to observe that a person apparently so well acquainted with the subject did not himself follow up his proposition by adding a plan or two for their formation, that something might be going forward of a tangible nature.

"Invention is not one of my faculties, I therefore do not pretend to any in sending you the above design of a **Steam-burning Stove*, but only offer it as a rough diagram for future improvement; or as *a something* to begin with, should you, Mr. Editor, deem it worthy of insertion.

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* I am aware that this term is open to the objection, that steam itself does not burn, but only one of its constituents after the steam has undergone decomposition; but the same objection applies to other combustibles, most of them leaving more or less of an incombustible earthy residue; and a decomposition must take place in them before actual ignition of the combustible part. If the invention gets into general use, it must be called by some plain significant name. Those however who do not like the cognomen I have given to it are of course permitted to baptize it anew.

"*a a* gives the outline of a design for the front of a stove, all the upper part of which is supposed to be viewed in section, for the purpose of bringing into view the essential parts; thus, *b b* is the boiler being one continued vessel in connection with the back part, forming with it three sides of a quadrangle; the back of the boiler is supposed to be of equal area with the sides, thus forming the vessel, surrounding the fire excepting in front, of sufficient capacity to hold water for the day's consumption. The front bars of the stove, not shewn, may be made according to fancy, precisely in the usual manner; as I propose by this method to admit the steam in that part constituting the grating immediately under the fuel. For this purpose there are two valves in the boiler, one on each side of the fire in connection with a brass or steel ornament (of the usual kind to stoves,) through which the steam escapes into a tube or open space under each of the hobs; from thence it descends down the steam pipe *c*, receiving an accession of heat in its passage into the lower part of the tube, where it issues out from underneath through numerous small perforations, and the current of air causing it immediately to rise and pass through the ignited coke, it is thereby decomposed and its hydrogen burnt, producing a magnificent flame over a coke fire, the same as in Mr. Evans's furnace.

"I am inclined to the opinion that steam under simple pressure will undergo the process of combustion quite as well as high pressure steam; I have therefore contrived my apparatus to answer for both, in this manner: let the ornamental knobs or urns before mentioned be hollow, the upper part forming a cover for the lower; in these therefore may be placed lead weights cast of the proper figure, and the valves being made in due proportion, steam of any required pressure may be obtained.

"The foregoing plan of a Steam Burner I have no kind of doubt would answer extremely with some slight modifications; I nevertheless hope to see shortly in the Register some great improvements to it, or a better arrangement of the parts altogether.

"A CYCLOP."

NEEDHAM'S PATENT METHOD OF CASTING STEEL.

The process adopted by the patentee (Mr. Needham, of Davis St. Fitzroy Square) of this invention is very similar in many respects to that described in our last number as the patented invention of Mr. Thompson, of the Chelsea Steel Works; but Mr. Needham having a priority in date of two months, (as appears by his specification) it is proper we should notice the circumstance, and give a brief outline of his patent also; because, whatever there may be of originality in the invention, of course exclusively belongs to him.

Mr. Needham states his new process of casting steel to consist in melting the metal in large fixed or stationary crucibles, (made of fire stone or Stourbridge clay, &c.) and allowing it when in a fluid state to run from them through apertures in the sides of the furnace into the moulds, without moving the melting pots, as is cus-

tomary; and the furnaces may be of any construction adapted to the invention. The size and figure of the melting pots will be according to circumstances, but he prefers those of an oblong form, with moveable covers, and placed upon bearers of fire-brick or stone, on a plane a little inclined from the horizontal line; at the bottom of each crucible a perforation is made, to which is fixed a tube that passes through the furnace to the moulds, with a plug at the external end; this being withdrawn, the fluid metal readily discharges itself (being upon an inclined plane) into the moulds. In this manner several melting pots may be fixed in one furnace, so that a quantity may be fused sufficient for articles of great magnitude; and as the different descriptions of steel require different degrees of heat for their fusion, the patentee recommends that those which require the least be placed in crucibles above those which require the most; by which arrangement in casting large shafts or cylinders of steel, those parts that require it may be formed with the best steel, while those parts, wherein an inferior steel answers the purpose, may in like manner be supplied with it. If it be required to cast a large cylindrical steel roller, the exterior may be made of a superior quality of steel, and the interior of a common quality, by placing a cylinder of wrought iron within the hollow cylindrical mould, and then directing jets of fluid steel of distinct qualities to flow into the opposite sides of this circular wrought iron partition; the steel will then adhere to the iron, and form one solid roller. Thus may be formed a steel roller of inferior cost, but equal in usefulness to one made entirely of a superior quality of steel.

CHRISTIE AND HARPER'S PATENT COALS.

Extraordinary and incredible as it may appear, this is nothing less than a patent for mixing coals of various descriptions together. We suspect that the brethren of the patentees, in the black diamond trade, will consider it as an atttempt to "steal a march" upon them, or at any rate as a merciless exposure of the mysteries of the craft; which we have been told lies chiefly in an artful (we ought to say, scientific,) method of "mixing-off."

The specification *informs* us that stone-coal, culm, and anthracite (why not call the last by its common name, *Kilkenny Coal)* when in a state of combustion give out little or no smoke, and that when a small proportion of bituminous coal is added to any one or all of them, the intensity and durability of the fire is improved, and that the said mixture is applicable to steam engine furnaces as well as other purposes. There is no precise, definite quantities, or proportions requisite to make this patent mixture, for it is very candidly admitted in the specification that this will depend upon the qualities of the said coals (which, by the bye, vary infinitely) and to the draught of the fire-place; but they state generally that one fifth of the bituminous coal may be added to four fifths of any of the others; and that where the bars of a furnace are one inch wide and

half an inch apart, with a good draught, that one fourth of the bituminous answers well for invigorating the rest.

Now it is well known all over the kingdom that stone coal, culm, and Kilkenny coal, burn with a red heat without emitting smoke, and they are for that reason used in many malt-houses, distilleries, &c. where a low, equable heat is especially desired; and this is owing to their containing no bituminous matter, but consisting for the most part of carbon, or charcoal, united to various earthy and stony matter. Maltsters and distillers must now however have an eye to the patentees, the same as if they were excisemen; for if they put the smallest quantity of bituminous coal in their furnaces to strengthen their fires, it will be an invasion of the patent right, and render them liable to all the penalties that may result from an action at law. Seriously we believe that this "invention" and "discovery" of the patentees, has been known and practised by thousands of persons in this and other countries, for centuries past.

SAW MILLS.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"I SHALL feel extremely obliged if one of your mechanical correspondents will favor me with a drawing and description of the most improved method of making and fixing circular saws for cutting veneers, &c. with the application of steam power.

"I am, Sir,

"Your most obedient Servant.

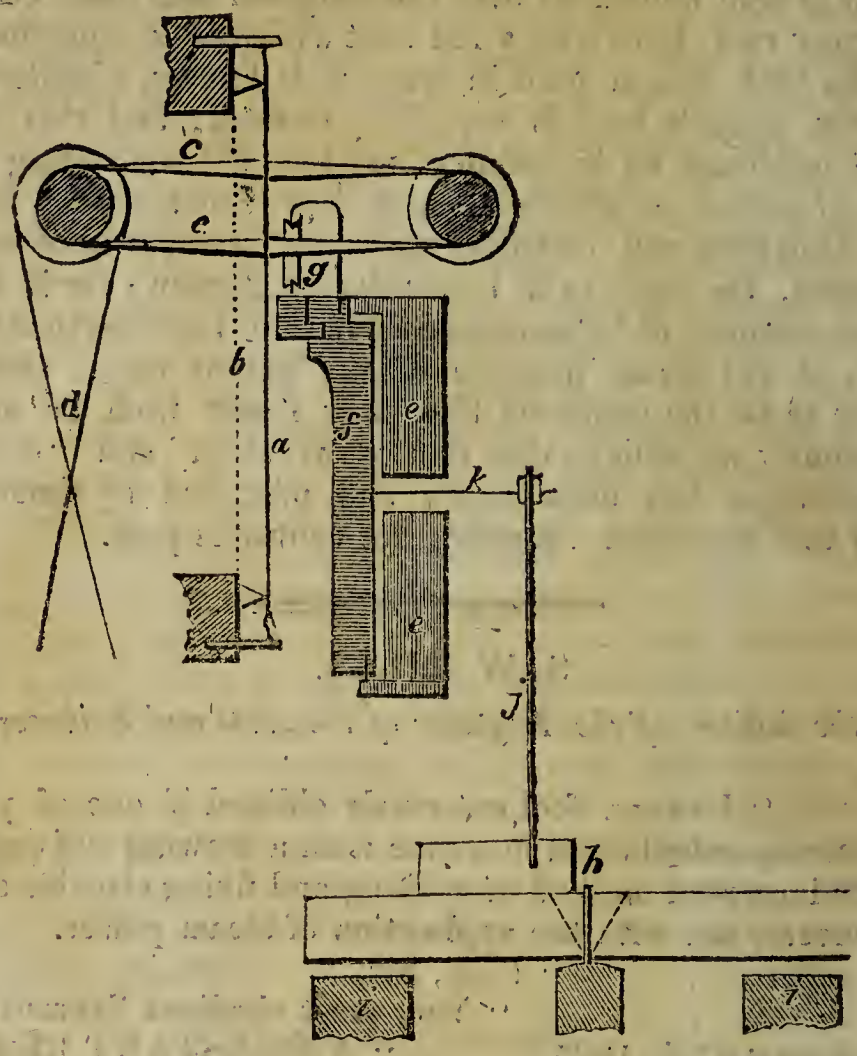
"*Bath, August 27th,* 1825. "A CONSTANT READER."

TODD'S PATENT PIANO-FORTES WITH VIOLIN TONES.

This invention appears to be well deserving of a patent-right as it is calculated for the production of a very charming musical instrument. The object is to give to piano-fortes the rich and lengthened tones of the violin; to effect this at pleasure, the foot of the player is pressed upon a lever (or pedal), which puts in motion an endless band, furnished with powdered rosin, and this band is made to rub against the particular wire in connexion with the key that is depressed by the finger of the player; and thus the same effect is produced as by the bow over the strings of the violin. Instruments so constructed will therefore have two distinct sets of tones: when the pedal is acted upon, the lengthened and beautiful tones of the violin will be produced—without it those of the ordinary piano.

The invention is not however confined to piano-fortes, but to all other instruments wherein the sounds are produced by the vibration of wires, or strings of catgut; but the most eligible instrument for its application the patentee considers to be the piano, more especially those of the upright or cabinet kind. The above diagram we have therefore selected from the specification to explain the construction

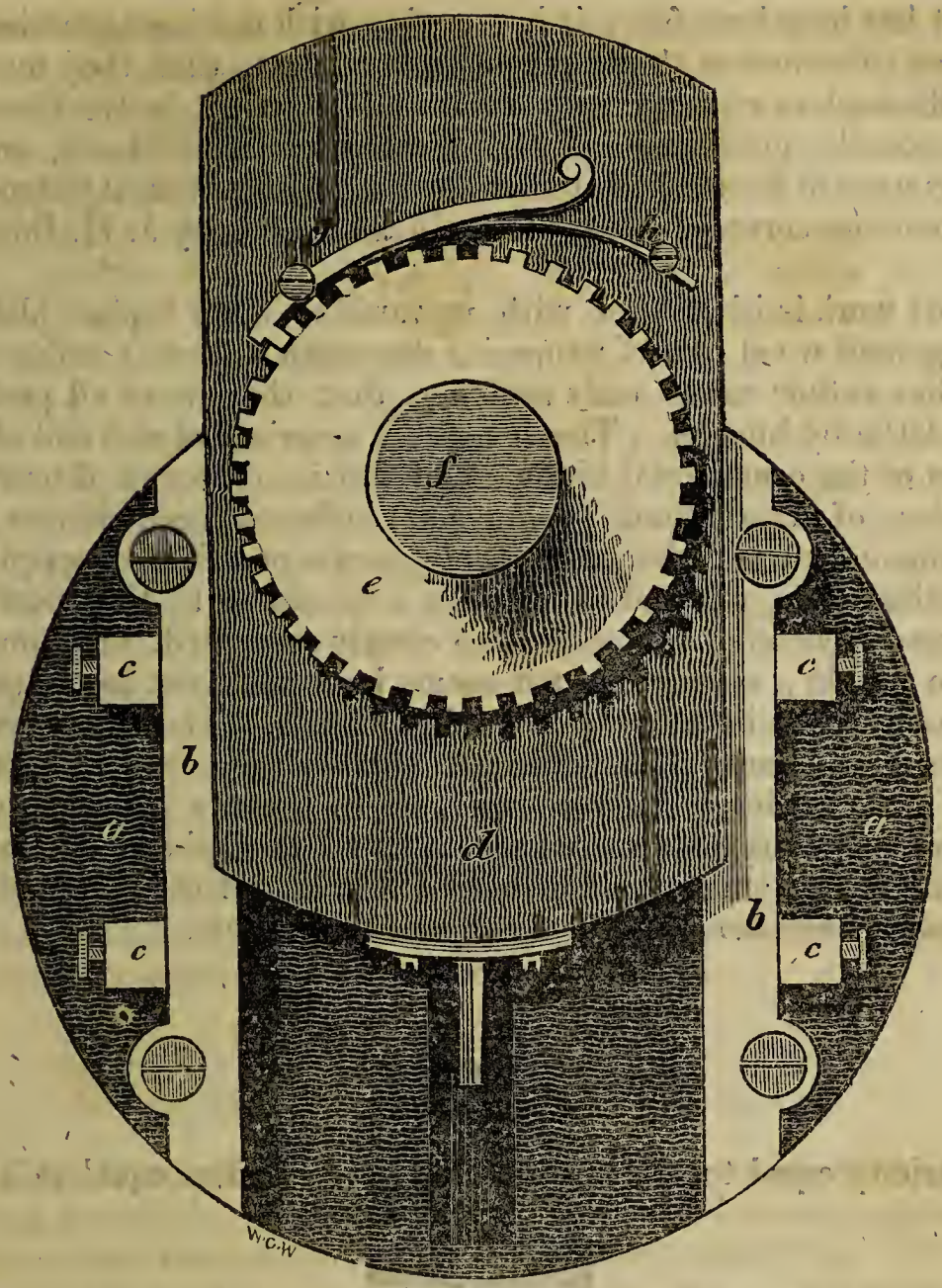
and modes of action of this very ingenious contrivance, when applied to piano-fortes of the latter description.



The figure gives a vertical section of the part; thus *a* shews one of the wires stretched across the bridges, by means of tension pins over the body of the instrument. *c c* is an endless band revolving over two rollers or cylinders, which are set in motion by the treadle cord *d*, operated upon by the pedal: this band is to be made of cloth, catgut, or other material capable of holding powdered rosin. *e e* is a frame of wood in which is made to turn a swinging piece *f*, and there are as many of these frames and swinging pieces as there are keys to the instrument. On each swinging piece are fixed wires bent in the manner shewn; their ends are reduced to a conical figure to form centres upon which revolve small brass rollers, as that at *g*.

h is one of the keys of the instrument moving on its fulcrum pin, and its two stops are shewn at *i i*, a vertical stem of wood (*j*) is fixed into the key, carrying above it, in a horizontal position, a wire *k*, which acts upon the swinging piece *f*. The wire *k* is fixed to the stem *j* by means of nuts placed on either side of the stem which screw on to the end of the wire, and by these means the extent of motion to be given to the swinging piece is regulated.

It will now be seen that when any key is depressed by the finger of the player, the little brass roller *g* is pressed against the endless band, which bending it a little out of the right line, causes it to rub against the wire *a*, and thereby produce a similar effect to the drawing of the bow over the strings of a violin.



ECCENTRIC CIRCULAR TURNING.

The art of turning is one of the most elegant, and at the same time one of the most indispensable operations in mechanics. By no other process can circular work be executed with such extraordinary dispatch, such beautiful neatness, and with a precision bordering upon absolute perfection. And when it is considered that an art which is so eminently useful, and pleasing in its results, may be easily acquired, we need not wonder that the practice of it should become a favourite amusement with the wealthy portion of the community; nor at the numerous beautiful specimens that are daily produced from the lathes of amateurs.

There are various descriptions of turning, for which lathes of different constructions are employed as more especially suited to the peculiar nature of the work. These are however very generally understood,* excepting that termed *eccentric* turning, and the want of a comprehensive and systematic treatise in this particular branch of

* Those who wish for information on these subjects may consult with advantage, *Moxon's Mechanical Exercises.*

the art has long been felt; it is therefore with much satisfaction that we have to announce to our mechanical readers, that they may now avail themselves of some very clear and practical instructions in a work recently published by Mr. Wetton, of Fleet Street, entitled "Specimens in Eccentric Circular Turning, with practical instructions for producing corresponding pieces in that art; by J. H. Ibbetson, Esq."

This work is illustrated with upwards of sixty copper plate engravings and wood cuts of a superior description, and it is due to the ingenious author not to omit noticing, that they were all produced in the lathe by himself. They consist of a variety of rich and elegant designs of the ornamental kind. The first is composed of seven sets of circles, of different radii, arranged at different eccentricities round the common centre; the author then gives a practical description of the method to be pursued to produce a fac-simile to the specimen; and every successive operation is so clearly explained, and emanates from so simple a system, that it seems impossible not to understand him, and not to be able to do as he directs. The next specimen consists of a beautiful arrangement of seventeen sets of eccentric circles; the reader is then shewn how to execute its very curious combinations in regular succession. As an example of the method pursued we here annex the fourth set of circles (of the seventeen just mentioned) together with the directions that follow.

FOURTH SET OF CIRCLES.

Eccentricity equal to 13, Radius equal to 3½

"Change the angular tool and fix No. 28 in the slide rest; but before it is fixed adjust its point to the radius and depth of the circle last turned. Produce the eccentricity by turning the slide screw of the eccentric chuck backwards five turns and a half. Produce the radius by turning the slide rest screw backwards one turn and a half. Then describe 48 equidistant circles." In this manner directions are given for every successive operation, which is made perfectly clear to the reader of the book by the description which precedes it. To give an idea of the diversity of design of which one simple uniform system is capable, we here add the seventeenth set of circles, which forms an etruscan border to the same figure.

We shall now proceed to describe Mr. Ibbetson's chuck by which these eccentric figures are produced.

a a is a plate of brass, or metal, of sufficient substance to be firm and solid, on which plate two slides of steel *b b* are affixed by the aid of screws: the holes which admit the screws are made a little oval, to enable the slides to move nearer or further apart if necessary; *c c c c* are four pieces of metal firmly fixed to plate *a*, and having a screw in each, which presses on the slides *b b*; *d* is a plate of metal or brass, sliding between *b b*, in a dove-tail, and must be made to fit very accurately when the slides are parallel to each other, and is moved between the slides by means of a screw *i*, working in a slit made in the plate *a*, and which screw regulates the eccentricity, as it moves the plate *d* either nearer or further from the centre of the chuck. *e* is a circular plate of metal, whose edge is cut into teeth, and which is capable of being turned round its centre, and is held in any position by the catch *g*, which falls in between the teeth, and is held in its place by a spring *h*. On the centre of the wheel *e* is affixed a screw *f*, (as exhibited by the shadow thrown on the same) whose threads correspond with the screw of the mandril of the lathe, for the purpose of fixing any chuck, on which is fastened the substance to be turned.

In Mr. Ibbetson's work, a side view of this chuck is also given, by which the proportion and figure of all the parts are more clearly understood. A slide-rest of a very improved kind is also minutely described, as adapted to the above eccentric chuck, and the work concludes by adding very exact directions for the use and application of these very ingeniously contrived instruments.

RICHMAN'S PATENT FIRE ESCAPE.

A Mr. Richman, of Great Pulteney Street, Golden Square, has recently invented a Fire Escape of a totally novel description, for which he has taken out a patent. His object appears to have been to invent some other means of escape than that of descending outside of a house from an upper room window into the street; in which there must, of course, be always some degree of personal risk, owing to the alarm and confusion of the moment.

The new apparatus is of a nature not to be easily understood without the aid of drawings, we can therefore only state generally that it is a highly ingenious contrivance, and most judiciously adapted for procuring the means of an instantaneous and perfectly safe exit on the roof of the house. Mr. Richman has published a circular, describing the uses of his invention, and one of them falling into our hands, induced us to give a call at that gentleman's house where we saw the machine put into operation, and where any person may view it between the hours of eleven and four. The following observations on the subject which we extract from the circular above-mentioned, appear to be worthy of consideration.

"It is a certain fact, that nine persons out of ten who (within these last twenty years) have lost their lives by fire in dwelling-houses in London, might have been saved, had they a commodious escape at the tops of their own houses.

"It is well known, that whole streets are so built that, in forty-nine cases out of fifty, a person may step with ease from the top of one house to that of the next, on the one side or the other; it therefore only requires the means of instantly producing an easy access to the top of the house, without the obstruction of locks, bolts, or bars; in attaining this object also I flatter myself I have succeeded.

"If a house takes fire in the lower stories, which is generally the case, all persons above must wait patiently for all the horrid chances already mentioned to be determined in their favour; for if there should be a trap-door in the roof, it is very small, and there is difficulty in the smoke, and most probably in the dark, to hunt for a ladder, put it up, unbolt two doors, &c. &c. so that it is next to an impossibility that an active man can resist suffocation from the smoke long enough to make his escape, and, therefore, a timid female has but little chance of saving her life.

"The Patent Machine in question is intended to be fixed at the top of the house, in using which, in case of alarm, if a female, six years of age, arrives first on the landing, (although there is not the least appearance of stairs or ladder,) she can, with the same facility as she can ring the parlour bell, produce (as it were by magic) a complete series of stairs, and a door open in the roof, through which the whole family can almost as intantly escape; then, by stepping on to the roof of the next house, they are as safe as if they were on the pavement in the street, without running any risk of the horrid dangers above described.

"If the roof of the next house should be a few feet higher, it is easy to keep a small step ladder there, which even a child could ascend with perfect safety; or if a few feet lower, it is easier (even if there is no ladder) to jump four or five feet, than forty or fifty.

"Independent of the convenience of this machine as a Fire Escape, it may be made extremely useful for other important purposes, viz. after a heavy fall of snow followed by a sudden thaw, or after a thunder storm, in either case it often happens that the ceilings, papering, and furniture, are damaged to a considerable extent by the overflowing of the gutters; now, instead of waiting for workmen to come with ladders, &c. a servant can have immediate access to the gutters, and at least remove the cause untill the workmen arrive to clear away the snow or other obstructions; and in addition to this, a gentleman, or even a lady if required, can with ease go up to see that the gutters are not neglected, and thereby prevent those accidents. Again, in small apartments, offices, &c. where bed-rooms are required over them, and there is not room to have fixed stairs to ascend, by this invention, a complete set of steps can be produced at night, and removed (in half a minute) at pleasure in the morning. Notwithstanding the facility with which this machine may be opened on the inside, it is so firmly secured, that it would be easier to break into any other part of the house, than at this door."

MISCELLANEOUS INTELLIGENCE.

Life Preservers.—Mr. T. H. Bell, of Alnwick, has invented a modification of Scheffer's Life Preservers, for the saving of persons from drowning. The latter invention, (minutely described in our 6th number) consists of a flexible belt or girdle to be worn round the body which being inflated with air, renders the wearer so buoyant that he may not only save his own life, but those of one or two other persons at the same time. Mr. Bell calls his *invention a marine cravat;* it is an apparatus of exactly the same kind as Mr. Scheffer's, but of less dimensions, being intended to wear round the neck, and fasten with a buckle behind. This appears to us to be rather a misapplication, than an improvement of Mr. Scheffer's really valuable invention. It seems by Mr. Bell's "invention," that he thinks it desirable to keep the person as deeply immersed in the water as possible, to hang him by the neck in a perpendicular position, with arms dangling, possibly for the purpose of catching fish; no drink would certainly be wanting, as the wearer would be compelled to take a draught of every pretty rippling wave; and he would thus be preserved from hunger and thirst, as well as drowning. We shall not be surprized to hear that the ingenious inventor has made a further improvement upon the same system, namely that of a *marine hat*, which it must be allowed, would "crown all."

Water-Works at Primrose-Hill.—A large reservoir for water is being constructed on the top of Primrose-Hill, for the supply of the new buildings in the neighbourhood of Regent's Park; it will be twenty feet in depth, and cover an area of two acres. The elevation of the water will be 175 feet above the level of the Thames, and as the supply will be had from that river, near Hammersmith, (a distance of seven miles) it will become necessary to raise it to that elevation by means of pumps and other hydraulic machinery. A great advantage will however be derived from the reservoir being so situated, as it will then flow through pipes up to the tops of the highest houses in the neighbourhood. It is said that the work is proceeding with great celerity, and will soon be completed.

New Pyrophorus of Tartrate of Lead.—In determining the composition of tartrate of lead, Dr. Friedmann Gobel, of Jena, observed that this salt when heated in a glass tube formed a fine pyrophorus. When a portion of the deep brown mass is projected from a tube, it instantly takes fire, and brilliant globules of metallic lead appear on the surface of the subject in ignition. The effect continues much longer than in other pyrophori.—*Edin. Phil. Journ.*

Identigraphy.—Mention is made in the Dutch papers of a new discovery in printing, to which the inventor has given the name of *Identigraphy.* It consists in a new application of the art of lithography, by which a reprint of common letter-press is obtained in a very short time: the inventor undertaking to reprint the foreign journals within two hours after their arrival by the mail.

The Water travelling Balloon.—This nick-name has been given to a new American Steam Boat, called the Trenton; her boilers

being placed outside the vessel *i i* suspended over the water on each side of the boat, so that should any accident happen the boiling water would be thrown into the river, without injuring the passengers. The space usually occupied by the boilers is turned into convenient and handsome dressing rooms, and the unpleasant degree of heat experienced in the dining cabins is by this arrangement entirely avoided. The improvements and the disposition of her machinery are spoken of in terms of high commendation.

New Machine.—M. Schwœbel, a mechanic of Strasburg, has just invented a triangular machine, with a lever, to replace the hydraulic lever, which possesses the double action applicable to all machines moved by water or horses either for spinning, flour-mills, sawing, forge-bellows, &c. It facilitates by its strength the machine to which it is applied, giving it a more regular movement, and fills the place of two horses where four are required, and is also very useful in times of drought, as it will work a machine with half the quantity of water.

Mexican Mining Pump.—A pump for one of the Mexican Mining Companies, of 1000 feet in length, has recently been cast at Cincinnati, on the Ohio. The bore is about four inches, and the pump was cast in one hundred pieces, of ten feet in length each. This stupendous pump cost six cents per pound, and each piece weighing one thousand pounds, the aggregate cost was 6000 dollars. It was taken to New Orleans by the steam-boat, Mississippi. From New-Orleans it was intended to ship it to some Mexican port, whence it is to be carried in waggons about three hundred miles into the interior. Finally it will be borne thirty miles up a steep and rugged mountain, on the backs of the Indians to its place of destination. This pump will be worked by a steam engine.

Poisonous Plants.—Five stamina, one pistil, one petal, and the fruit of the berry kind, indicate poisonous plants. The calyx double, glume valved, three stamina, two pistils, and naked seeds, indicate plants of a farinaceous quality, and fit for food.—*Literary Chronicle.*

The sleep of Plants.—The common chicken-weed, with white blossoms, affords a notable instance of what is called the sleep of plants, for every night the leaves approach in pairs, so as to include within their upper surface the tender rudiments of the new shoots, while the uppermost pair but one, at the end of the stalk, are furnished with longer leaf-stalks than the others, so that they close in the terminating pair, and protect the end of the branch.—*Ibid.*

To preserve Wall-Fruit from Ants.—The following easy mode of preserving wall-fruit from the ravages of ants has been sent to us by a correspondent:—Look for the place where they issue from the ground and travel up the wall: near to this place confine a toad close to the wall with three bricks at the side, and one at the top, so as to allow him air, put him also a little water in a shell or pot, and he will soon destroy all the ants.

To revive faded Writing.—Wash over the parts lightly with a decoction of gall-nut, to which a little vinegar has been added.

Damp Walls.—The dampness of the walls of rooms is frequently owing to the presence of some deliquescent salts in the mortar, or on the surface of the bricks; in such cases it has been found that washing the parts with sulphuric acid has caused them to become dry, by decomposing the salt.—*French Paper.*

The addition of a little plaster of Paris (sulphate of lime) afterwards would probably be making sure work of it. Ed.

To destroy Crickets and Beetles.—*(From the same.)* Sprinkle nux vomica in small powder over pieces of bread and butter, put them near the holes at night, when they will readily eat it and die.

To make incombustible Paper.—Reduce a quantity of alum to powder, to which add a small proportion of gunpowder, and dissolve the mixture in thrice its weight of water with heat. Dip the sheets of paper two or three times in this solution, whilst warm, and then hang them up to dry.

To give to water coloured Drawings or Prints the appearance of Oil Paintings.—First brush over very lightly a solution of isinglass in water, which allow to dry. Then dissolve one ounce of Canada balsam in two ounces of spirit of turpentine, and apply the solution with a broad camel hair brush.

Valuable properties of Chestnut Bark.—The bark of the chestnut tree contains twice as much tanning matter as oak bark, and nearly twice as much colouring matter as logwood. The colouring substance of Chestnut Bark is to that of Campeachy logwood exactly as 1.857 to 1. Leather prepared with this substance is more firm and solid, and yet more supple. This bark is the best substance for making ink; mixed with iron, it becomes a bluish black. The liquor drawn from this bark appears blue at the outside, like indigo; but it gives on paper the finest black. In dyeing it has a greater affinity for wool than sumach and gall-nuts. The colour obtained from this substance is unchangeable by air and light.—*Annales de l'Industrie Nationale.*

Roman Cement.—M. Minard has discovered that the property which the Roman Cement possesses of setting under water, belongs to almost all calcareous stones. Certain limestones, employed from time immemorial in the production of lime, give, *at pleasure,* a Roman cement which sets in a quarter of an hour, another which requires four or five days, and also a rich lime that will not harden at all. To this effect the stone must lose 8, 12, or 30 per cent by calcination. M. Vicat, to whom we are indebted for so many new facts with respect to mortars, has recently published one which perfectly agrees with the general remark of M. Minard, which is, that chalk feebly calcined gives a mortar capable of setting under water.

Various experiments induced M. Minard to presume that Roman Cements owe their quality to a subcarbonate of lime produced by the action of fire upon the natural carbonate. The happy conse-

quence which he has drawn from his numerous experiments, that Roman Cement may be made in almost every place where limestone is found appears to be beyond all doubt.—*Ann. de Chimie.*

LIST OF NEW PATENTS.

REFINING SUGAR.—To Charles Friena, of Bell Lane, Spitalfields, for improvements in the process of refining sugar. 26th July. Six months.

PROPELLING MACHINERY.—To John Reedhead, of Heworth, Durham, for improved machinery for propelling vessels of all descriptions. 26th July. Six months.

CARDING MACHINES.—To J. E. Brooke, of Headingly, Leeds, Yorkshire, and James Hardgrave, of Kirkstall, for improved machinery for scrubbing and carding wool. 26th July. Six months.

PRINTING AND DYEING CLOTH.—To D. O. Richardson, and William Hirst, of Leeds, for improvements in the process of printing or dyeing woollen cloth and other fabrics. 26th July. Six months.

SPINNING.—To James Kay, of Preston, Lancashire, for improved machinery for preparing and spinning flax, hemp, &c. by power. 26th July. Six months.

LAMPS.—To Richard Witty, of Scalcoats, York, for an improved chimney for argand and other burners. Sealed 30th July. Six months.

NEW ALTERNATING MACHINE.—To Joel Lean, of Fishpond House, near Bristol, for his newly-invented machine for effecting an alternating motion between bodies revolving about a common centre or axis of motion. Also certain additional machinery for applying the same to mechanical purposes. 30th July. Six months.

NEW OPTICAL INSTRUMENT.—To the Rev. W. Barclay, of Auldeare, Nairn, for an improved instrument to determine angles of altitude or elevation, without the necessity of a view of the horizon being obtained. 30th July. Six months.

SILK MANUFACTURE.—To R. Badnall, jun. of Leek, Stafford, for certain improvements in the manufacture of silk. 30th July. Six months.

WATER PIPES.—To S. Bagshaw, of Newcastle-under-line, Stafford, for a new method of manfacturing pipes for the conveyance of water and other fluids. 8th August. Two months.

SHIP-BUILDING.—To George Charleton, of Maidenhead Court, Wapping, and W. Walker, of the Mile-end Road, for certain improvements in the construction of ships, &c. 10th August Six months.

TO READERS AND CORRESPONDENTS.

A. B. is mistaken in his supposition with respect to common salt, he should enquire for the chloride of lime or *bleaching salt*; the latter is the most common of the many names given to it.

Tipton Mechanic must grant us a little further indulgence, many of the inventions mentioned are not yet specified.

J. B. has our best thanks—two of the recipes are inserted in the present number; the rest will appear soon.

A Well-Wisher may procure the ink he enquires about of any respectable stationer. We believe the addition of a little moist sugar to common writing ink adapts it well for the taking off impressions of letters by the copying press. With respect to the other subject he mentions we cannot inform him why his experiment has failed. We shall shortly insert another approved method of making the article.

Mr. Evans's observations on his new application of steam, in reply to Mr. Gilman's and Mr. Nevill's recent communications on the same subject, came too late for insertion, but care will be taken that they have a place in our next number.

G. R.—H. S.—Mechanicus,—and the Ghost of Archimides are received.

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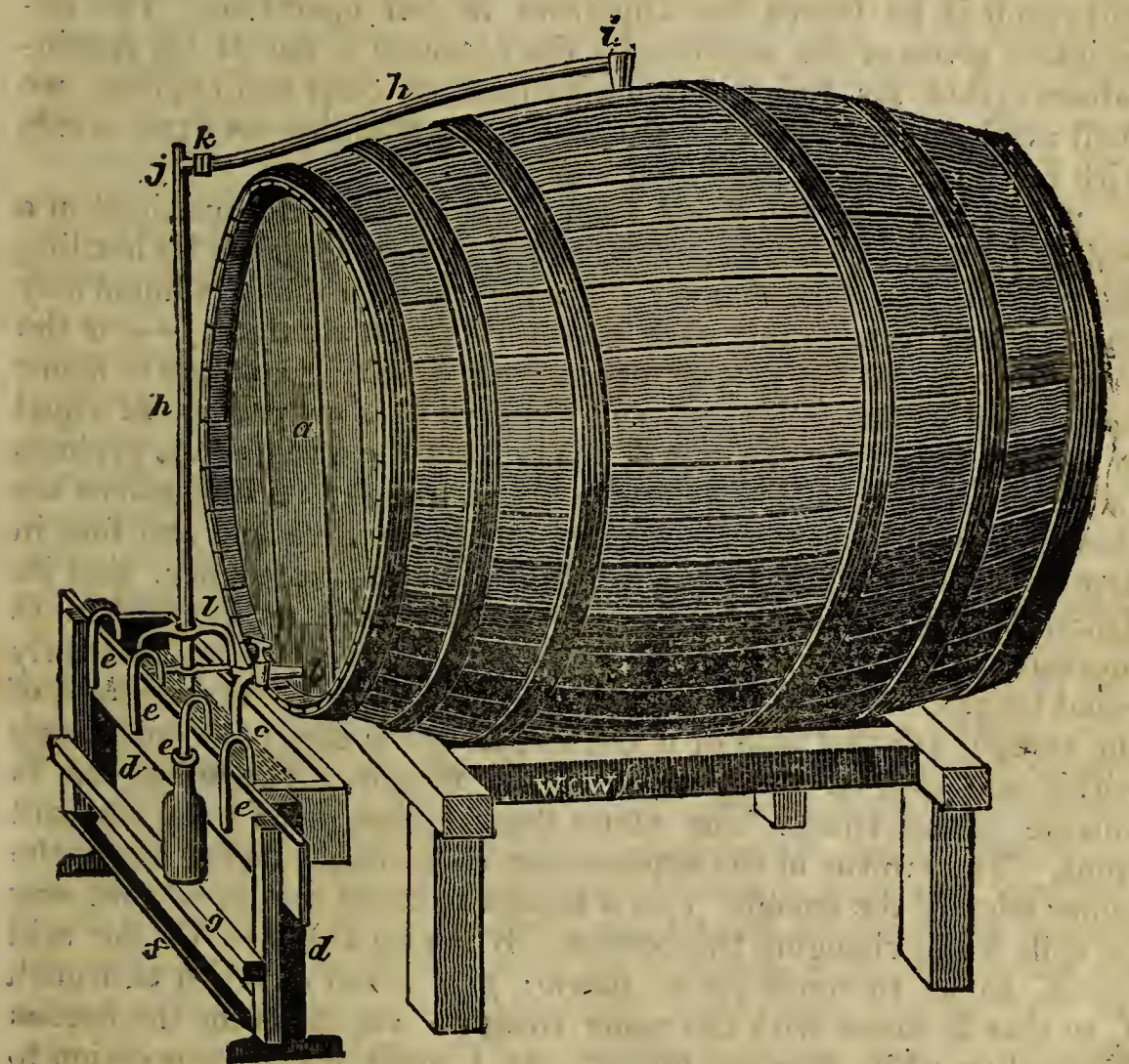
CONTENTS:

Masterman's Patent Apparatus for Bottling Wine, Beer, &c. - - - - - - - - - - 65
Hancock's Patent Ropes and Cordage - - - 68
Paul's Patent Steam Boilers - - - - - - 69
White and Sowerby's Patent Air Furnace for Melting of Iron - - - - - - - - 70
Hawkins's Hydraulic Weighing Machine - 72
Apparatus for Drying Mildewed Corn - - 73
Lambert's Patent for Manufacturing Paper from Straw - - - - - - - - - - - 76
Observations on the Piney Tallow Tree of India - - - - - - - - - - - - - - ib.

MISCELLANEOUS. Cheap Nutcracks, 79—Candles burn best in an inclined position, 78—Rancid Oil, ib.—Improved Extract of Bark, ib.—French Varnish, 79—Increase of Height at Rising, ib.—Metallic Casts from Engravings on Copper, ib.—List of Patents, Correspondence, 80.



MASTERMAN'S PATENT APPARATUS FOR BOTTLING WINE, BEER, &c.

THE present age may certainly be fairly termed one of improvement. If we look back only ten years, we can scarcely discover any matter or thing which has not (mechanically speaking) undergone an evident alteration for the better. We have not only new processes in almost every art, but every part of the apparatus by

which such processes are conducted, bear evident marks of a regenerating spirit, that it seems nothing short of perfection will satisfy. We have recently had occasion to announce the invention of new casks, new cocks, new air vents, new syphons, and we have now to describe a very ingenious application of them; in the invention, by Mr. Masterman,* of an apparatus for bottling of liquids with increased economy and dispatch.

The ordinary method of bottling is a very tedious and wasteful process; by the present patent method, the bottles may be filled uniformly to a precise point as fast as they can be changed, and without the necessity of any attention or examination on the part of the workman. Four bottles are thus constantly filling at a time, without being held, and all the workman has to do is to exchange them successively as quickly as possible; and as the liquid ceases to run when there is a sufficiency in each bottle, no inconvenience will result if he leaves the apparatus in full operation. The description given of the machine by the patentee in one of his specifications (that for Ireland) being particularly clear and explicit, we shall avail ourselves of that document, by adopting its exact words with reference to the preceding engraving:

"I assume that the liquid I am about to bottle is contained in a cask well closed, placed on its side, and in a proper situation for bottling the liquid in the usual manner. (It will be seen that the liquid may be contained in any other close vessel, rendered air tight,)—*a* is the cask; I drive into the proper hole a cock *b*, having a nozzle of about four or five inches in length, and having a bore or passage of equal or greater area than the sum of the areas of the whole of the syphons (after mentioned) added together; *c* is a trough; its dimensions are about fourteen inches in length, six inches in breadth, and four in depth. It is attached to the frame *d d* in such a manner, that its distance from the foot thereof may be increased or diminished at pleasure: *e e e e* are four metal syphons, having each a leg of nearly equal length. One leg of each is fixed to the inside of the front of the trough, (or that side of it farthest from the cask) the ends being within one inch of the bottom of the trough. The other leg is outside of the trough, and about three inches apart from its said front. The crowns of the syphons are about three inches above the upper edge of the trough, *f* is a trough to catch the liquid that may be spilt while changing the bottles. It is also attached to the said frame, so as to move up or down: *g* is a rail attached to trough *f*, so that it moves with the same trough. Its use is for the bottles to stand on while they are filling. As I shall not have occasion to mention trough *f* again, trough *c* must be understood when I afterwards mention 'the trough'; *h h* represents what I designate 'the 'air tube' the inner diameter of the perpendicular part thereof may be more, but ought not to be less than one inch; the inner diameter of the horizontal part need not be greater than about one quarter of an inch. The cross piece *i* is of solid brass, bored only so high as

* Mr. Thomas Masterman, of the Dolphin Brewery, Broad Street, Ratcliffe.

just to pass the end of the tube soldered into it. The horizontal part of the tube is made of pure tin, on account of its flexibility; the perpendicular part thereof may be made of block tin, or any other metal. The top of this part at *j* is closed. The two parts are connected together at *k*, by a union joint, in order that they may be detached when not in use: *l* is an iron bow or brace, placed across the trough for the purpose of retaining the air tube firmly in its proper situation. I place the trough under the cock, and fix it so high in its frame that the bottom of the trough may come within an inch of the orifice of the cock. I then fix the air tube into the brace *l* so that the orifice of the tube may be at least one inch above the orifice of the cock; but it ought also to be at least one inch lower than the level of the upper edge of the trough. The perpendicular part of the air tube ought always to be of such a length that its top may reach (when the tube is fixed as above ready for acting) higher than the surface of the liquid in the cask. The horizontal part of the air tube is then bent, so that the cross piece *l* at its end may be, and it then is, driven (air-tight) into a hole made either through the bung of the cask, or through a hole made for the purpose in the cask above the surface of the liquid therein. It is proper to observe, that there must be no passage for air into the cask, except through the air tube, by means of the orifice at its lower end.

"The apparatus being thus adjusted, I open the cock; the liquid then flows into the trough, until it rises so high as to close the orifice of the air tube. The consequence of this is, that the further admission of air into the cask is prevented, and the flow of the liquor through the cock ceases. I then put the syphons in action, by drawing the air out of them successively by the mouth, applied to a bent tube, one end of which is placed against the end of the syphon, so as to form an air tight tube with it. As I thus put each syphon in action, I place the bottles so that the end of each syphon enters the necks, and the point to which I desire to fill them is brought on a level with the orifice of the air tube, the rail *g* being adjusted so as to retain the bottles at this elevation. As the bottles fill, the surface of the liquid in the trough sinks, until it descends below the orifice of the air tube. The instant this occurs the air rushes into the cask, and the liquid immediately recommences and continues flowing therefrom, until it gains so much upon the discharge through the syphons, as again to rise in the trough so high as to close the orifice of the air tubes, and then the liquid ceases to flow from the cask as before. Thus, by this alternate action, it is evident that the surface of the liquid in the trough is always preserved nearly on a level with the orifice of the air tube. As each bottle fills, it is withdrawn quickly from its syphon, and replaced by an empty one. But if the bottles are suffered to remain they will never fill higher than about the level of the orifice of the air tube, which it has been shown is the level to which the liquid in the trough is confined.

"When the liquid to be bottled is malt liquor, or any other of a viscid nature, its frothing in the air tube would prevent the free admission of the air into the cask. I obviate this by placing in the

trough, under the orifice of the air tube, a floating vessel, containing more water than sufficient to fill the air tube up to the level of the liquid in the cask. This vessel (rising and falling with the liquid in the trough) causes the water in it to exclude the air from, and admit it to the cask, in the same manner as if the liquid in the trough were in direct communication with the orifice of the air tube."

The above is a description of the apparatus constituting my invention, according to the construction which I conceive to be the best; but the apparatus admits of numerous modifications which still retain the principles of, and are in effect my said invention. Those modifications are too numerous to admit of a particular description of each; I shall therefore confine myself to the description of the following one alone.

It is evident from the said description, that the chief principle of my said invention is the limiting of the surface of the liquid in the trough, so that it shall not exceed a certain level or point in the trough, and the maintaining of it nearly at such level. In the apparatus before described, this is effected by means of the said air tube, but it may be effected with a sufficient degree of exactness for practice by substituting for the air tube the following apparatus. "A valve of similar construction with the throttle valve of a steam-engine, is fixed in the lower end of the nozzle of the cock. To one of the ends of the pivot on which this valve works (and which end projects to the outside of the cock) is attached to a short lever, at right angles with the pivot, and to the end of this lever is attached a float. These several parts are so adjusted that, as the liquid rises in the trough, the float also rises, and causes the valves to shut when the surface of the liquid has attained its proper level, and of course prevents any further flow from the cock; and as the said level sinks by the liquid running from the trough through the syphons, the float also sinks, and causes the valve to open, and of course restores the flow from the cock. The consequence is, that the surface of the liquid in the trough, is always preserved at nearly the same level. It is evident that when the above substitution is practised, the cask must have vent."

Instead of describing any other modification of my said invention, I declare that any apparatus of whatever construction whereby the liquid to be bottled runs from the vessel in which it is contained into another vessel, and from thence through a syphon or syphons into the bottles, and whereby the flow of the liquid from the first into the second vessel is regulated by the rising or falling of the surface of the liquid in the second vessel, is to all intents my said invention, and I claim it as such; and I also declare that the using it for bottling of liquids, without my permission, will be an infringement of the said letters patent.

HANCOCK'S PATENT ROPES AND CORDAGE.

Mr. Thomas Hancock, of Goswell Road, some time ago obtained a patent for the manufacture of a substance to be used a substitute

for leather. This invention consisted in uniting or combining various fibrous matters together, first by a species of felting, and then by saturating them with caoutchouc in a liquid state, and exposing them when dry to severe pressure. He has now obtained a patent for the application of the same substance, whilst in a liquid state, to the manufacture of ropes, cordage, strands, yarns, and threads of hemp, flax, wool, silk, and other fibrous substances; much in the same manner that tar is applied to ropes and cordage; by which process these articles are rendered more or less impervious to moisture.

PAUL'S PATENT STEAM BOILERS.

The attention of mechanists seems lately to have been more devoted to improvements in the mode of generating steam, than to its subsequent application in the engine; and it is without doubt the most judicious direction of their inventive talents. We have recently had occasion to describe several new patents for boilers, the tubular form for which appears to obtain a preference, on account of its superior strength and convenience. The inventor of the apparatus we have now to describe is a Mr. John Theodore Paul, lately of Geneva, but now of Charing Cross, London.

Instead of the ordinarily shaped boiler, the patentee proposes to employ a long pipe, made of copper, or other metal of small diameter, which is to be coiled round the inside of the furnace, producing a conical figure, within which the fuel is to be situated; and thus by exposing a very extended surface of water to the action of the fire, steam of a very high pressure will be produced with great rapidity. As the great pressure of the steam renders the employment of a forcing pump necessary, a small one is fixed for injecting the water at one extremity of the pipe, which being heated intensely in its passage, escapes at the other end in the state of highly compressed steam.

The form of the furnace produced by the coiling of the pipe is not however limited to the conical figure, which will be altered according to circumstances.

The conical formed furnace described is inclosed in a casing made of sheet iron, with flanches fixed round the interior for supporting the coils of pipe; and a portion of the pipe is so bent as to form a grating upon which the fuel rests. The fuel is to be supplied through the upper part of the cone where the smoke escapes, or by an aperture made in the side of it, between the coils, for that purpose. The casing may be single or double; if the latter, the space between is to be filled with brick dust, coal, ashes, or some other slow conductor of heat: and if the former, it is to be coated with substances of a similar nature to prevent the radiation of heat from the interior. When the fuel is ignited, and the pipes heated to redness, the water is injected by the forcing pump in such small quantities at the lower end of the pipe as to cause it almost immediately to be converted into steam, which receiving a continual accession of heat in its revolutions

round the furnace escapes ultimately at the other extremity of the pipe, with great elastic force, in which state it proceeds to the engine. The particular shaped boiler or steam generator that we have now described is considered to be adapted to general purposes.

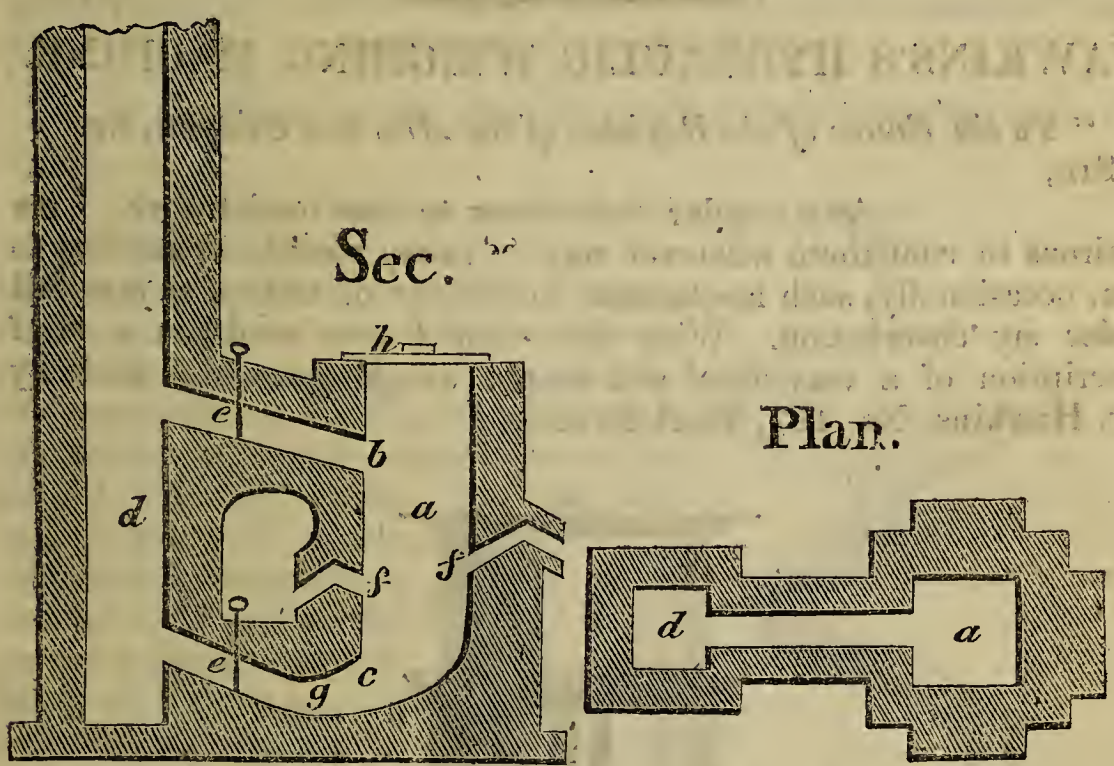
For constructing a tubular boiler on these principles adapted for a locomotive carriage, the patentee proposes a form somewhat different to the above mentioned. This may be described as composed of an upper and lower frustrum of the same hollow cone, the base of the latter, which is the largest, is placed upwards, and the former is placed within it, with its base or broadest end downwards; and this figure is produced by one continued coiling of the pipe. The furnace part thus formed is placed within a double casing of wrought iron, the spaces between being packed with some bad conductor of heat, it is supported by a circular frame work, and the ashes pass through a hollow inverted cone made of sheet iron, into the ash-pit below. The interior cone of pipes rises to about two thirds the height of the exterior, and the fuel which is supplied by an air-tight box is heaped up between them; air is supplied to the fuel by means of a pipe passed through the ash holes, and the force of the current may be increased by bellows applied to it. In this form of boiler the water should be injected from the upper extremity, and descend spirally to the lower part of the exterior cone; and from thence enter the interior cone, where it will ascend, continuing to receive an increased degree of heat, until it escapes at the upper extremity of the latter, in the state of highly compressed steam, with a pressure equal to about 150 pounds upon the inch.

The pipes are recommended to be made of copper, but any other tenacious metal may be used. The length for an engine of two horse power is calculated at 150 feet, with an internal diameter of only three sixteenths of an inch, and about one sixteenth thick, making the whole diameter of the tube but five sixteenths of an inch. For engines of greater power, the length, capacity, and thickness of the pipe will of course be in proportion. In some cases it may be desirable to have more than one tubular boiler to an engine to be worked by the same continued furnace, or by separate ones; and they may be heated by being placed in direct contact with the ignited fuel, or by radiation in various ways. The exterior surfaces of the pipes may be coated with clay or other suitable materials to protect them from too rapid corrosion by the intensity of the fire.

WHITE AND SOWERBY'S PATENT AIR FURNACE FOR MELTING OF IRON.

The usual method of preparing cast or pig-iron for the use of foundries, is, in reverberatory, or blast furnaces (called also cupola's), in which blowing machinery is employed for increasing the heat; the present invention of the patentees' costs much less in the erection, and is likewise adapted for conducting the process more economically than the former. The requisite degree of heat is obtained in this

new furnace without the necessity of resorting to any mechanical aid, but simply by the production of natural currents of air through lateral openings or passages; with the further advantage of causing a body of flame to be conducted over that portion of the metal lying in a fluid state at the bottom of the furnace, by which it is kept from solidifying prior to the whole contents being discharged. On these principles the patentees state that the furnaces may be made square, round, oval, octagonal, or any other convenient form, with passages for the admission of atmospheric air in various parts, and in different directions, according as they may be required to direct the heat. The



above figures are intended to illustrate by way of example, one convenient mode of effecting this object; they consist of a plan and a sectional view of the furnace (as stated upon them), the same letters of reference in each of the figures referring to the same parts: *a* is the body of the furnace in which the coke and metal is deposited; *b* and *c* are flues leading from the same into the vertical chimney *d*; the capacity or breadth of the flues is regulated by sliding plates called dampers *e e*; *f f* shew the situation of two of the lateral air passages (of which there may be any number); one of these is shewn as opening into the outside of the structure, and the other into an open archway or passage between the chimney and the body of the furnace: a man hole, for clearing out the bottom or bed of the furnace whenever required, is situated at *g*.

To set the furnace to work, the cover *h* is removed, and coke or other fuel thrown in, which may be lighted if required at either of the air passages *f f*; when the heat has been raised to the proper degree for the fusing of the iron known to workmen, the metal and coke are thrown in alternately in such quantities and proportions as may be required for the casting, when the furnace is again to be closed by the cover *h*. When the whole of the metal is reduced to

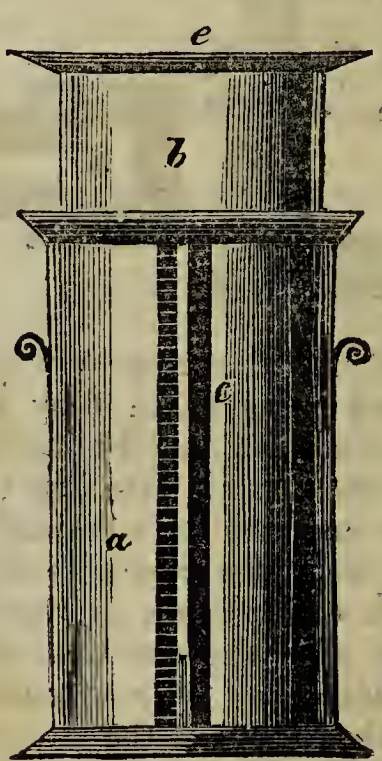
the fluid state it is run off from the bed by means of a tap hole in the lower part. The arrows (accidentally omitted in the engraving) shew the directions of the flame and the draft through the upper and lower flue into the vertical chimney; a body of flame is thus made to operate upwards in melting the metal, and another takes a downward course, passing over the bed of the furnace, preserving that portion of the metal which has been already melted and lying upon it, in a fluid state, (as before-mentioned) until the whole contents of the furnace are melted.

HAWKINS'S HYDRAULIC WEIGHING MACHINE.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"As a regular Subscriber to your useful work, I am desirous to contribute whatever may lie in my power, by sending to you, occasionally, such mechanical inventions of utility as may fall under my observation. With that view I now send you a brief description of a very novel and simple weighing machine made by Mr. Hawkins, No. 167, Fleet Street.



"*a* is a cylinder made of tin and japanned, which is partly filled with water; *b* is another cylinder of rather less diameter, resting upon and floating in the water contained in *a*:—*c* is a graduated scale with a glass tube running up the middle, fixed to the exterior cylinder, *a*; the bottom of this glass tube opens into the lower part of the cylinder, therefore the water always stands at the same level in both: *e* is a dish or scale for holding the goods to be weighed, the pressure of which causes the internal cylinder to sink lower and raise the water higher in the same proportion, and the exact weight is indicated by the graduated line on the scale, which is upon a level with

the surface of the column of water contained in the glass tube; precisely in the same manner as the temperature of the atmosphere is shewn by the mercury in the tube of a thermometer. It appears upon the whole that this singular and elegant contrivance is well calculated to weigh accurately, which may at any time easily be proved by placing a given weight into the scale.

"*Water-Lane, Fleet Street,*
"*July* 25th, 1825.

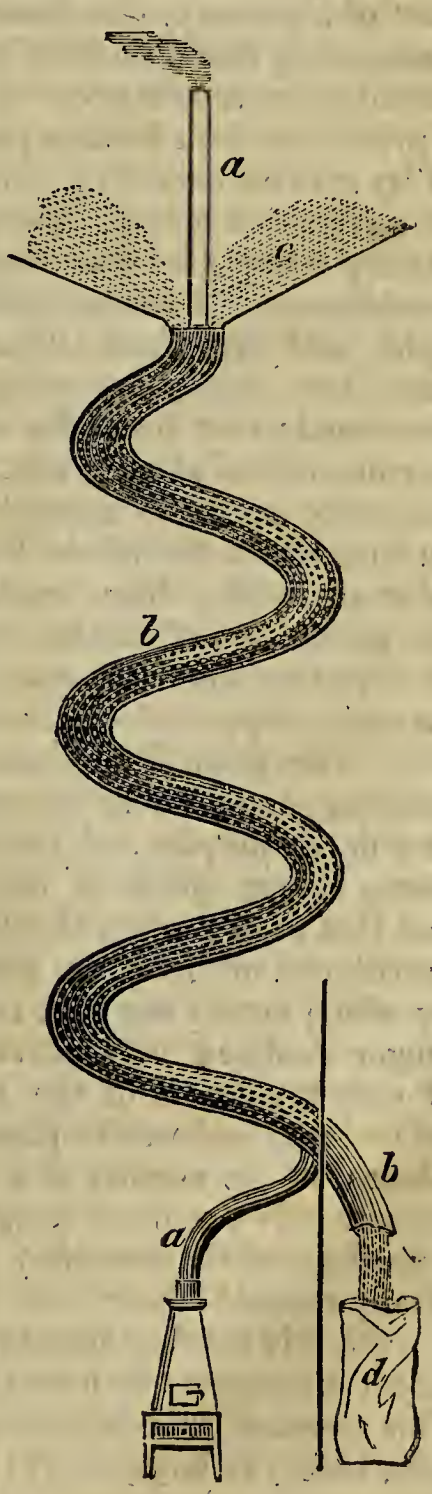
"R. S———E."

APPARATUS FOR SPEEDILY DRYING DAMP OR MILDEWED CORN.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"IT is, I believe, a well ascertained fact, that grain may be kept uninjured for an indefinite period of time, if air and moisture be carefully excluded. If any thing were wanting to prove this, the extraordinary experiment made with the Indian corn found in the graves of the antient Peruvians, (buried more than 300 years ago) which, when sown, vegetated, and came to maturity, is sufficient proof of the fact to set all doubts at rest. To preserve grain, however, for only two, three, or four years, with its nutritious properties unimpaired, is all that a nation can require; as the produce of seasons of dearth and of scarcity might then be equalized, and *bread be maintained at a low and regular price.* This the tillers of the soil and the working part of the public generally, have an undoubted right to expect from the owners of the land, in return for their labour in producing every thing for them.



"It not unfrequently happens, during a wet harvest season, that the corn is necessarily carried from the field in a damp state; and as but few farmers have the means of properly and speedily drying it, large quantities are irrecoverably spoiled, after all the labour and expence of the production. The ordinary method of drying on the perforated tiled floor of a kiln is usually resorted to, *where it can be obtained*; but it is a very tedious, defective, and expensive mode; besides

being attended with great labour, owing to the necessity of its being continually to be turned over and spread about by a workman, whose utmost care is insufficient to cause every part to receive an equal degree of heat.

"To procure the adoption of any new apparatus for the purpose of drying corn, it is necessary that it should be of simple construction, of small cost, and occasion but little labour in its use; I have therefore thought that something of the following kind might be rendered generally eligible for the purpose, as it admits of either a large or small quantity of grain being dried at a very trifling expence, and the apparatus may be made of any size to suit the magnitude of the farm where it might be erected. The apparatus is likewise self-acting, requiring scarcely any labour or attention.

"I propose to have a cast iron pyramidical stove *a* in the lower part of a granary, warehouse, or barn, with a spiral tube of cast iron (something like a distiller's worm) fitted to the top of the stove, and reaching to above the roof of the building, for conveying off the smoke. I prefer cast iron for this purpose to wrought or sheet iron, on account of its greater durability, in order to render repairs unnecessary for a long series of years; wrought iron stove pipes soon wear out, are usually fitted very inaccurately at the joints, and are exceedingly troublesome. I would have the mould for my cast iron tubing made light, and have them all cast alike from one mould, in pieces about three feet long; excepting the top and bottom piece, which would necessarily vary from the others. The joints should be made by a circular rebate at each end, so accommodated that the upper end of one piece would fit accurately into the lower end of another, and so on throughout the whole length of the spiral chimney; and every joint on putting them together should be properly luted, to prevent the possibility of smoke escaping, which might be easily done. If an objection should be made to the weight of such a tubing, it might be easily supported (if necessary) in various obvious ways.

"The grain I suppose to be deposited in the top floor of the building, or rather in one corner of the same; and it appears to me as a desirable plan, if the building should consist of several floors, that a square piece of equal area in each floor should be cut away; and that such portion should be left open from one to the other, and partitioned off from the rooms, in the same manner as a stair-case; by which means the heat radiating from the stove or tube, would be longer confined in that situation where it would be most required. If only the corner of the building were thus appropriated, it would be no inconvenience to place the grain on a small flooring of inclined planes, in the manner of a hopper, as shewn at *c*. The grain would then readily run down between the interior and exterior tubes (which I shall presently describe) without the necessity of the intervention of any manual labour.

"*b b* is another spiral tube to be made of wrought iron, and of larger dimensions than that of the cast iron chimney which it encloses. This exterior tube is to be punched *(from the outside to the inside)* with holes, as large as will prevent a grain of corn passing through,

and as numerous and as close to one another as possible. The configuration of this exterior tube should, of course, be precisely similar to the other, so as to be kept uniformly throughout its serpentine course, at the same distance apart from it; which I propose to be about an inch and a half. The rough projections in the inside of the exterior tube, are of infinite service in giving a rolling motion to every individual grain, so that being spread over a very extended surface in a thin stratum, and every grain being put in motion, the heat would be communicated over every part, and the resulting vapour rapidly extricated by its freely passing off through the perforations. The length of the passage between the tubes may be from 40 to 100 feet, according to the size of the apparatus (the longer of course the better); and when it comes within four or five feet of the stove, I propose that the course of the exterior tube be turned from the stove pipe (which may be so much heated near the stove, as to injure the vegetative property of the grain, should it be required for sowing) and that it may pass from thence through the partition before-mentioned, into some receptacle or receptacles, capable of being closed air-tight. As these receptacles should also be proof against the attacks of rats, mice, and other vermin, it is probable that the employment of metallic casings, made either of thin sheet iron, or lead, would be most desirable. If the vermin could be altogether kept out of the granary, by some of the usual precautions, then the preserving of the grain from the air only might be an object easily and cheaply obtained. What strikes me as one of the most desirable substances to be employed for this purpose, is the new patent material in imitation of leather, recently invented by Mr. Thomas Hancock, and described in the last number of your work, which consists of a fibrous felted cloth, saturated with liquid elastic gum or caoutchouc. This fabric must be entirely impervious to air and moisture, and extremely pliable; I therefore think if it were made into bags for receiving the dried corn, the latter might be preserved in a perfect state for a long series of years.

"I beg, however, to be understood as only submitting to your readers what I consider to be a preferable mode of drying corn thoroughly, rapidly, and almost without trouble, leaving the subsequent preservation to be adopted as circumstances or situation might render eligible.

"Instead of punched sheet-iron for the exterior tube, wire-work might be substituted, and the distance between the exterior and interior tubes (in either case) to be preserved by means of stout cross wires. These cross wires would offer a desirable impediment to the too rapid descent of the corn, which may, however, be regulated so as to be made fast or slow, by merely enlarging or contracting the aperture by which the corn makes its exit.

"I should apologize, Mr. Editor, for the length of my communication, and have to request, should you deem the subject worthy of insertion, in your valuable work, that you will curtail it by crossing your pen through all that is extraneous.

"Your Constant Reader,

"H. L."

LAMBERT'S PATENT FOR MANUFACTURING PAPER FROM STRAW.

We are somewhat surprized to find that the attempt to fabricate paper from such a substance as straw is again renewed; and our surprize is increased upon observing, that the new patented process is very nearly similar to that previously adopted for the same purpose, and which has been considered to have entirely failed. The patentee is a Mr. Louis Lambert, a French gentleman lately from Paris; his process is as follows:

Having collected a quantity of straw, all the joints or knots are to be cut away, and the remainder boiled with quicklime in water, for separating the fibres and extracting the mucilage and colouring matters. (Instead of quicklime in this part of the process, caustic, potash, soda, or ammonia, may be employed.) It is then to be washed in clear water to get rid of the colouring matter and lime, and afterwards subjected to the action of an hydro-sulphuret composed of one pound of quicklime and a quarter of a pound of sulphur to every gallon of water, for the more effectual removal of the mucilaginous and silicious matters. After this, the material is to undergo several successive washings in different waters, to get rid of the alkaline and other extraneous matters, which may be conveniently effected by beating in the ordinary paper mill. When no smell of sulphur is left the water is to be squeezed from the fibrous material by mechanical pressure, and then to be bleached by chlorine, by exposure on a grass plat, or any other convenient and well known means. It is then to be washed again to get rid of the bleaching ingredients, next to be reduced to pulp by the common apparatus for the purpose in a paper mill, and then moulded into sheets. The subsequent operations are, in other respects, similar to paper made from the usual substances.

OBSERVATIONS ON THE PINEY TALLOW TREE OF INDIA,

By Dr. Benjamin Babington,

[*Extracted from the Quarterly Journal of Science.*]

This singular substance, the doctor observes, "is a concrete inflammable, partaking of the nature of wax and oil, which from its appearance, may not inaptly be termed a tallow. It is in use only in the town of Mangalore, (province of Canara), and is there employed medicinally as an external application for bruises and rheumatic pains, and likewise, when melted with the resin of the same tree, is used as a substitute for tar in paying the bottoms of boats. The method of preparing this material is simply to boil the fruit in water, when the tallow is soon found to rise to the surface in a melting state, and on cooling forms a solid cake. Thus obtained, the Piney tallow (Piney is the native name of the tree which produces it) is generally white, sometimes yellow, greasy to the touch, with some degree of waxiness, almost tasteless, and has a rather agreeable odour, somewhat resembling common cerate. It melts at a temperature of

97½°, and consequently remains solid in the climate of India, in which respect it differs from palm or cocoa-nut oil; wrapped up in folds of blotting paper, and submitted to strong pressure, scarcely sufficient oil, or elain as it termed by M. Bracconot, is expressed to imbue the inmost fold. Its tenacity and solidity are such, that when cast in a rounded form of nine pounds weight (in which state the specimen I possess was sent from India) the force of two strong men was not sufficient to cut it asunder with a fine iron wire, and even with a saw there was considerable difficulty in effecting a division."

After some further observations on the general appearance of this substance, the doctor proceeds to detail some chemical experiments, to ascertain its composition and habitudes; after which he describes a series of experiments with a view to determine the eligibility of employing it in the manufacture of candles; he says,—

"When manufactured into candles, it comes with facility from the moulds, thus differing from wax, which does not readily admit of being cast; it gives as bright a light as tallow, and has the advantage of that material in being free from unpleasant smell, and in not emitting a disagreeable odour when extinguished. It unites in all proportions with wax, spermaceti, and tallow; and forms compounds with the two former, intermediate in their melting points, according to the proportion in their ingredients, and better adapted to the purpose of making candles, than the pure and more fusible substance itself."

With a view to ascertain the comparative combustibility of Piney tallow, candles of the materials undermentioned were cast; one mould was used for all, and the wicks were composed of an equal number of threads. Having been accurately weighed, they were burned for one hour in an apartment in which the air was unagitated, and at a temperature of 55°.

	Weight in grains when lighted.	*Weight at the end of one hour.*	*Loss.*
Wax,	840	719	121
Half Wax, half Piney Tallow,	770	631	139
Spermaceti,	760	604	156
Half Sperm, half Piney Tallow,	777	625	152
Animal Tallow,	811	703	108
Half Tallow, half Piney Tallow,	792	681	111
Cape Wax,	763	640	123
Piney Tallow,	812	702	110

For the succeeding experiments we must refer the reader to the source from which we derived the preceding information, as our narrow limits oblige us to be concise. We must not, however, omit to mention the result of a chemical analysis of three grains of the Piney Tallow, which was as follows :—

Carbon	2.31 =	770 =	10 atoms
Hydrogen	.37 =	123 =	9 atoms
Oxygen	.32 =	107 =	1 atom
	3.00		

The doctor concludes his very valuable communication by observing that the Piney Tallow could be imported into this country at less than one fourth the price of wax, and that although it does not possess all the advantages of that substance, it is still considerably superior to animal tallow.

MISCELLANEOUS INTELLIGENCE.

Candles burn best in an Inclined Position.—(*From a Correspondent.*)—"After a candle has been lighted so long as to acquire a wick of nearly an inch in length, it should be set in the candlestick so as to form an angle with the horizon, of from 40 to 50°, which may be easily done when the socket of the candlestick is considerably larger than the candle; it will then burn with nearly as good a light, without snuffing at all, as a candle that is frequently snuffed, and it will consequently last longer. There are, however, these conditions to be observed; the air of the room should not be disturbed with currents, nor should it be placed very near to another burning candle, nor near to the fire, which might cause the tallow to overflow and drip. Observing these precautions, a candle so placed will frequently be found a great convenience, as it will burn with a constant steady flame without the trouble of snuffing, and snuffers are not always at hand for the purpose. The upper end of the wick projecting beyond the rest in an inclined position, it falls off in the state of a fine white impalpable powder, as it is consumed."

[This method of burning candles has certainly its advantages, and we have seen it practised by several persons for four or five years past.]—Ed.

Rancid Oil may be recovered and made perfectly sweet, by heating it in a vessel with a quantity of magnesia.

Improved Extract of Bark.—The common extract of bark, used in tanning leather, is said to be materially improved by the addition of seven or eight pounds of the red berry which grows upon sumach. It retains all the resinous matter in complete solution, and causes an earlier precipitation of the woody fibre. Its excellent effects are soon observable upon the leather, by its rapid and complete absorption of the tan, besides imparting to it a much finer colour.

Varnish for Furniture, called French Polish.—The most beautiful varnish for household furniture is that invented by the French, and termed by them *plaquer* (from the verb plaquer, to plate) as the substance covered with it becomes plated with resin. It is made by dissolving in a pint of spirits of wine, half an ounce of each, shell lac, seed lac, and sandarac, over a gentle fire, frequently stirring it. To make use of it, a roller is made of list and covered with a soft linen rag; with this is taken up the smallest possible quantity of cold drawn linseed oil, (by just touching the surface) which is rubbed circularly and evenly over a small part of the wood,

so as to saturate the pores of the surface; immediately this is done, rub in a small portion of the polish diluted with a little spirits of wine, which will shortly produce a splendidly bright and very smooth surface. The wood should be perfectly clean, and free from all other preparations, otherwise the effect will be much lessened.

Increase of Height at rising.—It has frequently been noticed, that persons are taller in the morning after rising than at night, previous to going to rest: in some persons the difference is as much as an inch. This is supposed to be owing to the expansion of the cartilages between the vertebræ of the back bones (which are twenty-four in number) during the night, and which yield considerably by the continued pressure of the body when in an erect position during the day. From this cause, soldiers, who have been recruited in the morning as above the standard measure, have been rejected upon remeasurement in the evening as below the standard.

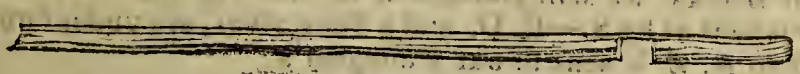
Metallic Casts from Engravings on Copper.—A most important discovery has lately been made, which promises to be of considerable utility in the fine arts; some very beautiful specimens of metallic plates, of a peculiar composition, have lately appeared, under the name of "cast engravings." This invention consists in taking moulds from every kind of engravings, with line, mezzotinta, or aquatinta, and pouring on this mould an alloy, in a state of fusion, capable of taking the finest impression. The obvious utility of this invention, as applicable to engravings which meet with a ready sale, and of which great numbers are required, will be incalculable, as it will wholly prevent the expense of retracing, which forms so prominent a charge in all works of an extended sale. No sooner is one cast worn out, than another may be procured from the original plate, so that every impression will be a proof. Thus, the works of our most celebrated artists may be handed down, *ad infinitum*, for the improvement and delight of future ages, and will afford at the same time, the greatest satisfaction to every lover of the fine arts.

CHEAP NUTCRACKS.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"Sir,

"As Nuts are now in season, it may probably be useful to some of your readers to know that a *pair* of Nutcracks may be quickly made in the following simple manner: cut a stick of hazel, or other wood, a little thicker than a man's thumb, and about thirty inches long: at six or eight inches from one end cut a notch like this,



wide enough to receive a nut, and nearly through the stick; so that it may be easily bended in that place. When used, the long end is to be held under the left arm, the short end acting as a handle, and the nut to be inserted in the notch.

"*Near Chesterfield,* "I am, Sir,

"14*th Sept.* 1825. "A Well-wisher to the Register."

LIST OF NEW PATENTS.

WOOLLEN CLOTHS.—To Samuel Lord, J. Robinson, and J. Forster, all of Leeds, for improved machinery for raising the pile on woollen cloths and other fabrics, and also in pressing the same. 11th August. Two months.

SAFETY TO COACHES.—To W. Hirst, H. Hirst, W. Heycock, and S. Wilkinson, all of Leeds, for certain apparatus for preventing coaches and other vehicles from overturning. 11th August. Six months.

SEASONING TIMBER.—To John Stephen Langton, Esq. of Langton Juxta Partney, Lincolnshire, for an improved method of seasoning timber, and other woods. Sealed, 11th August. Six months.

BEDSTEADS AND SOFAS.—To Jacob Perkins, of Fleet Street, for an improved construction of bedsteads, sofas, &c. 11th August. Six months.

SILK MANUFACTURE.—To H. R. Fanshaw, of Addle Street, London, for an improved apparatus for spinning, doubling and twisting silk. 12th August. Six months.

SECURE COFFINS.—To James Butler, of Commercial Road, Lambeth, for a new invented method of making coffins, for the effectual prevention of bodies being taken therefrom, after interment. 12th August. Two months.

PERFORATING METAL PLATES.—To Marc Lariviere, of Frith St. Soho, for a new machine, for perforating metal plates of gold, silver, tin, copper, &c. particularly applicable to sieves in lieu of other substances employed. 15th August. Two months.

POLISHING APPARATUS.—To J. A. Taylor, of Great St. Helens, London, for a new polishing apparatus for household purposes. 13th August, Six months.

FIRE ARMS.—To Charles Downing, of Bideford, Devon, for certain improvements in fowling pieces, or other fire arms. 15th August. Two months.

BACK STAYS AND BRACES.—To A. Shoolbred, of Jermyn Street, St. James's, Middlesex, for improvements in, or a substitute for back stays and braces, for ladies and gentlemen, chiefly to prevent relaxation of the muscles. 18th August. Six months.

IRON MANUFACTURE.—To Philip Taylor, of the City Road, for certain improvements in the making of iron. 18th August. Six months.

FULLING MILLS.—To Peter Williams, of Leeds, and James Ogle of Holbeck, York, for improvements in mills for fulling or felting woollen cloth. 20th August. Six months.

NOTICE TO OUR READERS AND CORRESPONDENTS.

The increased expences incurred in conducting this Work, owing to the nature of a great proportion of the original articles usually introduced, render it a necessary measure on the part of the Proprietors to make an advance of One Penny upon the price of the future *numbers. The information which it has recently contained of New Patents, and other valuable Inventions and Discoveries, cannot be obtained in any other work at less than eight or ten times its cost. The small advance now proposed will enable the Proprietors to make some important improvements, which they doubt not will prove acceptable to the majority of readers, and with the view of enriching its pages with whatever is new and valuable in the Arts and Sciences, the Proprietors now take the opportunity of announcing to Correspondents, that they will be happy to make a liberal compensation for Original Communications, subject (of course) to the approval of the Editor.*

We thank W. S. for the perusal of the book he kindly sent to us:—it is left at our Publisher's to be returned. H. H. will find the information he wants at page 134, vol. ii. of our work.

We really cannot insert W. R's Letter, on account of the epithets it contains; upon reflection he will see the impropriety of giving publicity to such animadversions.

The communications of W. H.—I. S.—A. B. and a Constant Reader (on the Burning of Bricks) we will endeavour to insert in our next.

The subjects sent us by S.—F. D. and a Subscriber, are under consideration.

An answer to A. Z. is sent to our Publisher's.

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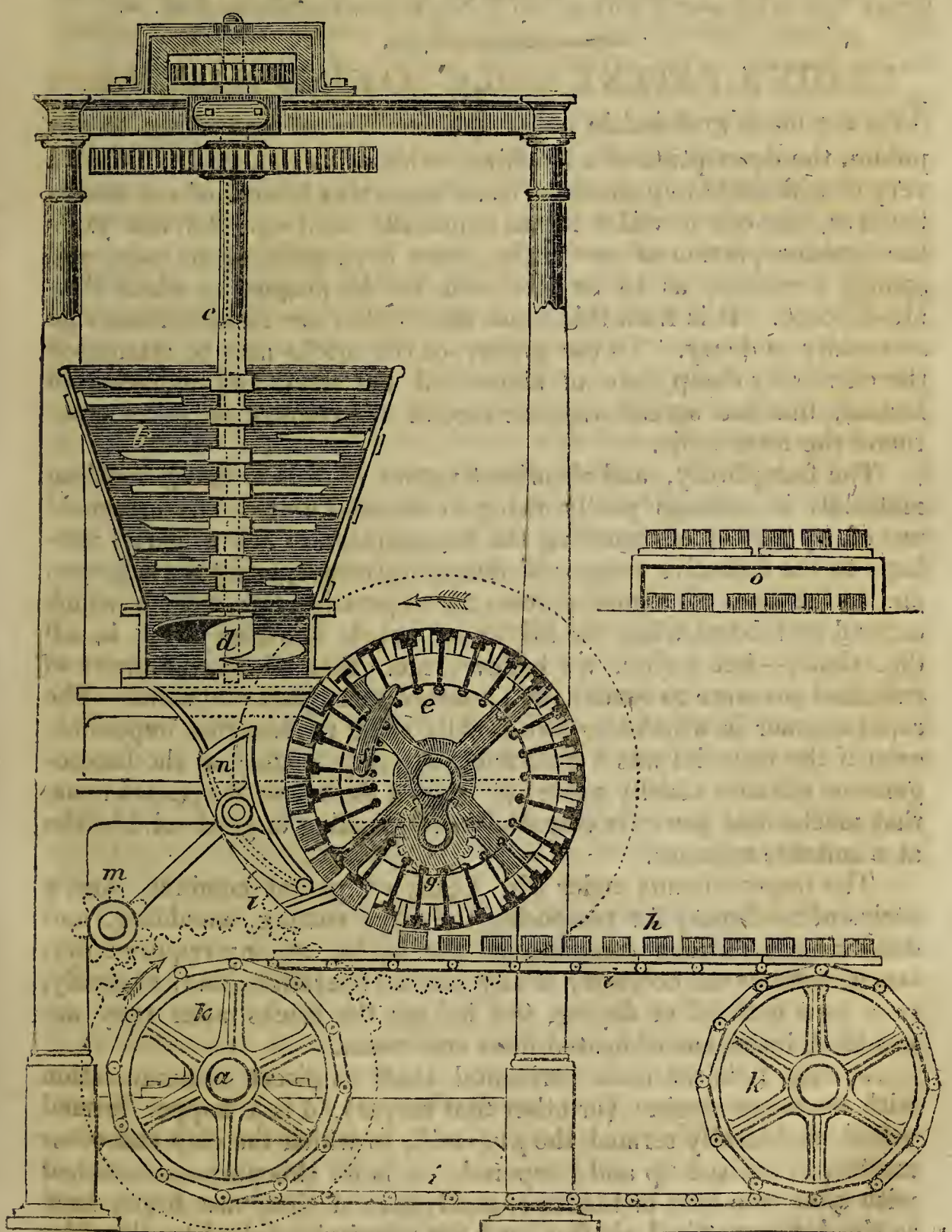


PATENT BRICK-MAKING MACHINERY,

EMPLOYED BY THE

PATENT BRICK COMPANY.

CONTENTS:

Leahy's Patent Brick-Making Machine - 82
Improvement on the generating of Steam 84
American Steam Stove - - - - - - - - 86
Burnett's Patent for a new Rotatory or Endless Lever Action - - - - - - - - ib.

Miscellaneous. French Waterproof Cloth or Silk,--Potatoe Paint,--Phosphorescence of Potatoes,--Paste for sharpening Razors, 92--Certain Cure for the sting of a Wasp,--New Hydraulic Machine,--New Plough,--Enormous Telescope,--Construction of Chimneys,--Light and Heat, 93,--An hydrous concrete Sulphuric Acid,--Glass for Optical Instruments,--Action of Animal Poisons on Plants,--Transfusion of Blood, 94--Caustic, a Destroyer of variolous Eruption,--Anatomical Preparations,--Devil's Tree,--American Geography,--Society Islands, --The Hide of the Sea Horse,--Queries, 95--New Patents, Correspondence, &c. 96.

LEAHY'S PATENT BRICK-MAKING MACHINE.

We are much gratified in being the medium of conveying to the public, the description of a machine, which is calculated to effect a very considerable improvement in an important branch of our manufactures, and one in which it was especially wanting. Of late years the greater portion of our bricks, have been made of so loose and spongy a texture, as to be very unfit for the purpose to which they are devoted. It is from this cause chiefly that our modern houses go so rapidly to decay. To the quality of the bricks may be attributed the extremely damp state of almost all the small and middle-sized houses, that are spread over the face of the country for many miles round the metropolis.

The frangibility, and absorbent nature of this *ordinary* building material, is perhaps partly owing to the adulterated mixture made use of, by way of economising the consumption of clay; partly perhaps to the defective manner of tempering or preparing the mixture, and to the want of a good process for separating the stones, which expand and burst when the bricks are burnt, splitting them in all directions;—but owing, we believe, more than all to the want of sufficient pressure to render such a mixture compact and solid. The rapid manner in which they are usually made renders that impossible even if the material was a good tenacious clay, instead of the heterogeneous mixture usually made up. Upon the whole it appears to us, that mechanical power is essential to the making of good solid bricks at a suitable expense.

The improvements under Mr. Leahy's* patent combine, first a series of machinery for tempering the clay, cutting, moulding, and delivering the bricks complete at the hacks, at any required distance, without the necessity of any manual operation; and, secondly, in a new method of drying and baking the bricks after they are moulded, by means of heated flues and steam.

a, Fig. 1, is the main horizontal shaft in direct communication with the steam engine (or other first mover), *b* is a hopper formed vessel, technically termed the *pug-mill*, in which the clay and other matters are mixed up and tempered. It is for this purpose furnished with cross iron bars or blades of steel, part of these are firmly fixed to the *hollow* vertical shaft *c*, and the remainder bolted to the sides of the pug-mill, and they are so arranged that those fixed to the shaft cut in as they revolve between the others. The clay is delivered into the hopper or pug-mill, by means of an endless chain of buckets

* Mr. W. Leahy, Engineer, Great Guildford Street, Southwark.

(in the same manner as the ballast is raised in the Thames); it is then cut up and tempered by the knives and bars in the pug-mill, and gradually descending, it falls, or rather is forced by the superincumbent pressure upon the circular inclined plane *d*, which consists of a single thread or spiral turn of a very large screw, occupying the whole internal space of the lower *cylindrical end* of the mill, where it is exhibited in section. This screw, or circular inclined plane, is fixed to a central shaft passing longitudinally through the hollow shaft, and a slow reversed motion is given to it by means of an intermediate wheel acting upon pinions in the upper part of the frame. The blades in the hollow shaft revolve in the pug-mill at the rate of fifteen turns in a minute, grinding and dividing the materials much more completely than in the ordinary mode of brick making; in this attenuated state it is forced upon the circular inclined plane of the screw, and as this slowly revolves in a contrary direction at the rate of five turns in a minute, it takes hold of the clay (by a peculiar adaption not easily described), and forces it out of the mill in a very compact state, into a receptacle below; one side of which is always in immediate contact with the moulds as they successively present themselves in their rotation; and those two sides of the receptacle which are at right angles with the former are closed by iron cheeks, between which the lever or forcing flap *n* acts by pressure, and fitting closely prevents the escape of the clay, so that it can only pass into the moulds. These moulds are placed round the periphery of a circular frame *e*, made of flat iron rings fixed upon bars or spokes, and turning upon a *fixed* shaft. There are twenty-five of these moulding boxes in one circle, but as the frame *e* may be of any width, it may contain twice twenty-five, thrice twenty-five, or even more on the circumference of the cylinder, provided the engine is capable of affording the requisite power or force to cut out and mould so many bricks at each revolution. Every moulding box is furnished with a false or moveable bottom, to which rods are attached for the purpose of pushing out the brick when moulded, and drawing back the bottom to its place to receive a fresh portion of the clay.

The manner in which these operations are effected reflect great credit upon the ingenuity of the inventor, because they appear to be done by the simplest possible means. The ends of each of the moulding-box rods are bent at right angles, and an eccentric piece *f* is so fixed that as the moulds revolve, and at the moment that the surface of each is covered, by being in contract with the clay, the end of the rods pass over this eccentric piece, which gradually draws back the moveable bottom, and after it the clay, by adhesion; for owing to the false bottoms being ground and fitted with great accuracy a vacuum is produced by this process; mechanical pressure is therefore not required to fill the mould, but simply to render the brick solid and compact: and this is produced by the joint and powerful action of the circular inclined plane *d*, and the flap forcer *n*, to which a backward and forward motion is given by the *thrusting* of a rod attached to a revolving crank. The moulding boxes immediately they are thus filled

are subjected, alternately, to the action of a steel scraper, which levels and smooths their surfaces, and which is made to operate by the pressure of springs. The bricks now completely formed, and fast in their moulds, pass downward in their revolution, which brings the ends of the rods under the operation of a cylindrical roller, with grooves made round it at equal distances; into these grooves the ends of the rods successively pass, which in their revolution force back the rods, and thereby thrusts out the bricks from the moulds on to boards placed underneath to receive them.

The bricks so made are shewn being carried forward to the hacks or drying house, borne upon an endless chain or web *i i*, to which a continued motion is communicated by the revolution of the two pentagonal drums or wheels *k k*, and it is evident that on this principle the bricks might be carried forward to the distance of half a mile or more if required.

The upper part of the engraving represents a side elevation of the machine, and in the lower it is shewn in section, and although these views give a general idea of the nature of the construction of the apparatus, it has been impracticable to shew the gearing by which the several motions are produced, we will, therefore, attempt to describe it as follows. Upon the horizontal shaft, *a* (which makes two and a half revolutions per minute) is fixed a toothed bevil wheel, which derives a bevilled pinion on an upright shaft, (not shewn), nearly at the top of this a spur-wheel is fixed, which works into a pinion fixed upon the upper end of the hollow shaft *c*. which carries the knives or blades in the pug-mill. Upon the upper end of this upright shaft (before-mentioned, not shewn) is also fixed a pinion which works into an intermediate pinion, turning upon an axis. This intermediate pinion acts upon another pinion affixed to the *internal* shaft, communicating a slow and reversed motion to it, and also to the circular inclined plane affixed to it at the lower end. On the main horizontal shaft is fixed a spur wheel *m* which gives motion to the crank, and the flap forcer *n* connected to it. *o* in the separate figure gives the form of the shelves composing the drying apparatus; they are so constructed, to prevent the necessity of their being touched by hand, which also keeps them apart and preserves them in a great measure from inclement weather.

N.B. Mr. Leahy's mode of drying bricks by flues and steam will be given in our next; also an account of Mr. Rhodes patented improvements in the construction of the clamps used for the burning of bricks.

IMPROVEMENT ON THE GENERATING OF STEAM.

"To the Editor.

"SIR,

"DEEPLY impressed with the vast importance of this subject as connected with steam navigation, and knowing that your pages are dedicated to the promulgation of useful science, I beg to give you the result of a course of experiments by Mr. I. Bellingham, so famed in Ireland for his various mechanical and scientific improve-

ments. He finds that coal tar is the cheapest of all fuel, when applied by a constant jet on ignited coke or coal, and by forming what he terms a hot chamber, which is simply an oven with eight retorts oval-shaped, kept at what mechanics call a cherry-heat, in the opposite end of the boiler, set after the manner of gas retorts for the distillation of coal; which all the smoke is passed through prior to returning through the water in the iron flue to the chimney. This gives a powerful impulse by the complete combustion of every particle that escapes ignition in the first fire, as well as the great advantage of burning so much more oxygen, by the increased draft in consequence of the rarefaction of the air in the red hot chamber. The stove that contains the hot chambers is encircled by the water in the boiler, as well as the entire of the fire places, on the same plan as Mr. Williams's Steam Packets, at Liverpool; with only the addition of a second row of fluted cast-iron bars, placed horizontally over the common ones, merely allowing room to charge with coke or coal between, for the tar jet to play upon. The tar is pumped into an air-tight wrought-iron tank, with a small tube from the bottom: the pressure of the air, with a stop-cock and crank worked by the engine, may be regulated to keep a uniform flame diffused all over the inside of the flues. This arrangement prevents the possibility of fire being communicated to any part of the ship.

"He has also discovered that the generation of steam is much accelerated by putting in bundles of straw or sticks into the boiler, but he found that a surface of boards strongly put together so as to cover the entire water, and float on it by suspension rods on the surface, answers better, and prevents the wence and splashing of the water so injurious in condensing steam. He also recommends casing the boiler with thin boards, and at least five inches deep of charcoal to husband the heat, and prevent the hitherto injurious consequences to goods in the hold of steam vessels. This improvement will enable a vessel to go to any part of the world, as the oil tar will not occupy half the room of coals, and does not cost half the price. Iron tanks of any shape, to suit the different parts of the ship, can be made to hold it, and when consumed the tank can be filled with water, which will in no way alter the trim of the vessel.

"I beg to state that it is with Mr. Bellingham's kind permission I have the pleasure of making this Communication;—and

"I have the honour to be, Sir,

"*Oxford St. London,* "Your obedient Servant,

"*Sept. 20th,* 1825. "H. W. BROWN."

P. S.—"One very striking improvement in the above plan is, that all the atmospherical air must pass through the coal, as the stove doors are only opened once in eight hours, to charge with coke, coal, or wood; the jets play through small apertures, and the flues are not chilled, as by the present mode of constantly opening the doors to charge and rake the fire. The labour is so diminished that one man is quite equal to the charge of the largest engine boiler now in use."

THE AMERICAN STEAM STOVE.

"Sir,

"Having seen in your Register, part 13, vol. 3, proposals for introducing a certain quantity of water, or rather steam, into our stove-grates, as an additional article of fuel, suggested by the success of some experiments made by *Messrs. Evans, Gilman, and others*, I am reminded of a somewhat similar Invention, successfully tried and adopted at Philadelphia last year; and which I expected to have seen noticed in your publication before this time. It was there applied to heating air in close stoves for warming rooms (instead of open fires); a method, in my humble opinion, that deserves every encouragement. What a blessing would it be to invalids, as well as to many other classes of society, during the winter and spring! The Philadelphian stove or water-burner, was said to be something like a large tea urn, which, with its apparatus, was made of a size to fill up an ordinary parlour hearth, and had an elegant appearance: they were made of different sizes. At the lower part it was furnished with a bath of water, over which was placed a very small neat grate, in which was kindled a fire of coals or charcoal, which the air and water, or perhaps steam from underneath, caused to burn with an intense heat; above this was a chamber or oven, containing from four to six gallons, for warming the air. It was furnished with pipes, stop-cocks, &c. for diffusing the warm air through the room, then stopping it up while another portion was warming. I think it was said, also, that it consumed its own smoke. The price of the ordinary sized ones was said to be about twelve dollars. Having mislaid my memoranda I do not recollect the inventor's name, nor any further particulars; but it was considered as one of the mechanical wonders of the day about the close of the last year, and likely materially to promote health, comfort, and economy: with sincere wishes that it may,

"*Bristol*, "I am, Sir, Your humble Servant,
29th Sept. 1825. "T. W. H."

Specification *of a Patent granted to* Mr. Henry Burnett, *of No.* 10, *High Holborn, for "certain Improvements in Machinery for*

A NEW ROTATORY OR ENDLESS LEVER ACTION,"

BEING AN IMPROVED SYSTEM OF GEARING,

Invented by his friend, Mr. Harrison G. Dyer, of *Boston*, in America.

When we acquaint our readers that the Specification of this truly interesting and valuable invention was drawn up by Professor Millington, it is hardly necessary to observe that it is therein described with so much clearness and ability as to render it perfectly unnecessary on our part to introduce a single word by way of explanation; we shall, therefore, give a verbatim copy of the whole of that document, (furnished us by the kindness of the patentee) as every circumstance attending it is well deserving the attention of the mechanical reader.

SPECIFICATION.

I, the said Henry Burnett, do hereby declare, that the nature of my said invention, and the manner in which the same is to be produced, applied, and carried into effect, is hereinafter particularly described and set forth, that is to say, my invention consists in a new arrangement and combination of mechanical principles, applicable to all purposes, where *rotatory* motion has been, or is to be produced, by cogged or toothed wheels, and pinions, or what in large machinery is technically called gears; either for the purpose of gaining mechanical power and diminishing velocity of motion, or vice versa, for multiplying small quantities of motion, and gaining increase of speed, and in this way it is applicable either to the most complex and elaborate train of wheel work or gearing, or to the most simple form in which it can be constructed. One of the most essential features in my said improvement is, that however numerous the wheels may be in any piece of machinery constructed upon my principles as hereinafter described, still a uniformity of action will be obtained throughout the whole, far surpassing that which can be obtained by any of the ordinary modes of constructing gears or wheel-work, and that, with *increased strength*, and *greatly diminished* friction, since that which is usually a *rubbing*, is converted into a *rolling* action, and only simple points are called into action at once, and these are constantly operating upon the line which joins the centres of any pair of revolving axles or pivots. The change in the velocity of motion is likewise much increased, so that effects which before required *large wheels* with very *considerable numbers* of teeth may, by my improvement, be brought about with *much smaller wheels and lower numbers of teeth*, whereby the *expense* of constructing machinery on my principle will be *considerably reduced*. The manner in which I bring about the several beneficial effects above enumerated is as follows; instead of using wheels and pinions of the form and construction generally adopted, I use wheels with bevil or oblique teeth, such as are shewn at *a c*, in fig. 1 of the annexed illustrative drawing; and instead of permitting the teeth or cogs of such wheels to act into or to be acted upon by pinions or other wheels, I cause them to act into, or be acted upon by spiral grooves in the nature of endless screws, which grooves are cut and formed on the arbors, spindles, or axles, which come into contact or gearing with such wheels as seen at *b d* in the said figure. Now, it is evident, that if the wheel *a*, be a driving wheel, or one which has power applied to it to turn it round, it will, by its motion, communicate a rotatory or revolving motion to the arbor, or spindle *b*, which carries the wheel *c* fixed upon it, and this wheel *c* will, in like manner, give rotatory motion to the spindle *d*, or if instead of imagining the moving power to be applied to the wheel *a*, we suppose it applied to the axis *d*, then a rotatory motion will be communicated to the wheel *c*, and its axis *b*, which will in like manner give a much slower motion to the wheel *a*, and thus an increase of power will be obtained proportionate to the respective velocities of *d* and *a*; and so of any additional wheels and spindles which might be introduced into the machine. The foregoing short account contains a description of the general principles of my aforesaid invention, by which it may at first sight appear that it contains nothing more than wheels, having oblique or bevel teeth, and common endless screws to act into the same, neither of which are in themselves new or capable of being appropriated in their ordinary state, by any patentee, and accordingly in their separate and ordinary state I make no claim to them under or by virtue of my hereinbefore in part recited letters patent. But in their joint and combined state, and in the manner in which I use them, it will be found not only that the mode of using and combining them is essentially different from that commonly practised, but that they are attended with beneficial results not heretofore contemplated; and I shall therefore now proceed to point out how they differ from the ordinary modes of construction, and how I therefore ground my claim to the novelty of my invention of their use and application when combined and used as hereinbefore described. The wheel with bevil, or oblique teeth, has heretofore been used either to act into other wheels or pinions having their teeth similarly disposed, and thus producing the same relative velocity of motion as in other wheels

with common teeth, or cogs; or else to act into an endless screw in the ordinary way. Now the common application of the endless screw is, in the direction of a tangent line (or very nearly so), to the wheel to which it is applied, and whether it be the driver, or is driven, the direction of the force exerted by, or upon it, is constantly in a direction coincident with its longitudinal axis, and never in that of its radius; while a perfect rubbing action always takes place between the threads of the screw and the teeth with which they are engaged, thus producing an excessive friction, not only on this point of contact, but likewise on the resisting pivot of the screw, and thus though the common endless screw is a convenient and steady driver, it can seldom be driven to advantage, unless the rake of its thread be very great, or it is assisted by the momentum of a fly wheel. In my application of the spiral or endless screw, its axis is not a tangent to the wheel with which it is engaged, but it is placed at right angles to the plane of the wheel, or parallel to its axis, in every case, except that of bevel gear, or where the two axes of motion make an angle of each other, and then it is only so far removed out of its parallelism as to accommodate it to the necessary angle in which the motion requires to be communicated.

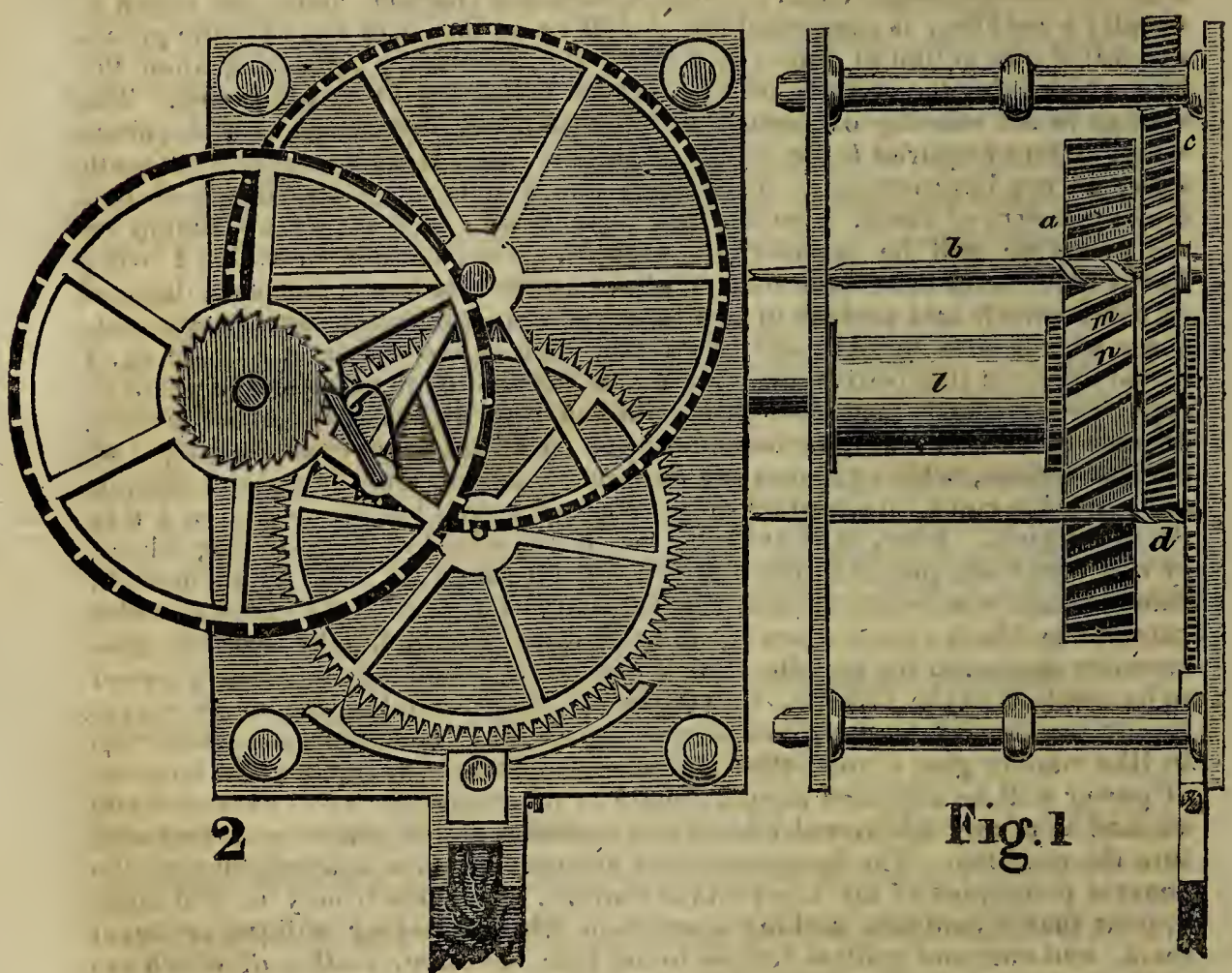
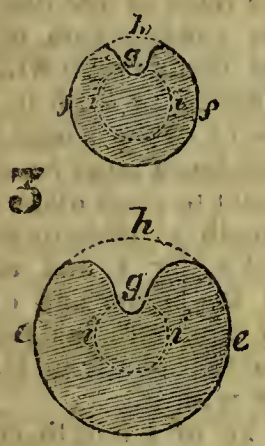


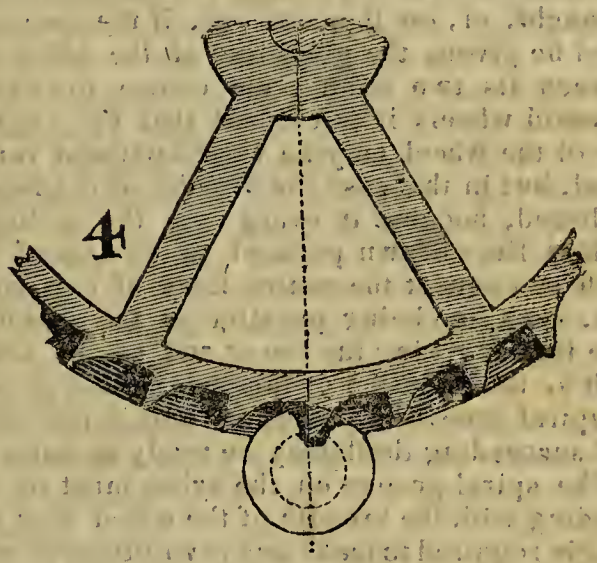
Fig. 1

The consequence of my arrangement is, that the power of the screw or spiral, as I apply it, whether it be driver or driven, is no longer exerted in the direction of its length or axis, but in that of its radius, consequently it can be driven by the wheel with the same facility that it will drive the wheel, (difference of leverage according to their respective radii only excepted) and thus it becomes changed from its character of the endless screw to that of a pinion of a single leaf, but which leaf being extended quite round the arbor, never becomes disengaged from the tooth or cog with which it is acting, until the arbor has made an entire revolution, and by that time another tooth or cog is ready to engage with it, by which the most steady and equable continuous motion is produced. Independent of the last-mentioned advantage from the circumstance of the wheel and screw having their axes parallel, or nearly parallel to each other, and from there being but one point of bearing in action

at once, and that uniformly on the line of centres, and that action passing over equal spaces in equal times, and in the same direction; all the sliding action which would take place between a wheel and an endless screw, is converted into a complete rolling action, whereby nearly the whole of the friction that would otherwise occur, is destroyed, so that the mere external appearance of an endless screw is maintained without any of its detrimental properties; and as all the points of contact must be in the line of centres joining one axle to another, without the possibility of change, so it follows that this new mode of constructing gears resembles most closely an endless or perpetual series of levers, and that its action is more equable and regular than any gearing heretofore constructed.

As the tooth of the wheel may be admitted into, and made to bear almost close to the centre of the arbor, or at any rate much closer than where a pinion is used, a great difference of relative motion may thereby be given from one wheel to another, or from a wheel to any arbor, as is required in many parts of clock and watch work, and many other machines; and further, by this arrangement, a great comparative increase of power or velocity may be gained. Consequently, this gearing is equally applicable and valuable when a quick or powerful motion is required; and it possesses one perfectly original and valuable feature, that any required strength may be given to the arbor





without affecting either its power or velocity. This will be rendered evident by an inspection of *fig.* 3, in which the external lines *e e*, and *ff*, represent the sections of two arbors of very different sizes, and consequently strength, while their mechanical action is exactly similar. The section is taken transversely through that part of the arbor on which the spiral groove in which the tooth is to act, is formed as at *g*, in both the sections, but it will be seen, notwithstanding the difference in magnitude of the two sections, that they have but one common pitch line marked *i i*, in both the figures; and as these pitch line circles are of equal diameter, it follows that the two arbors may work into the same wheel, and that their power and velocity must be equal, notwithstanding their disparity in strength, which gives my arrangement a decided superiority; for even when the tooth of the wheel is brought almost close to the centre of the arbor, which is next to impossible either in common or oblique toothed wheels and pinions, I can upon this principle always command as much strength in the arbor as may be requisite for the work it has to perform; all that is necessary being so to cut or file away the external circular part of the arbor, shewn by a dotted line at *h*, to such an extent as to clear the next two adjacent teeth, before they come into action, as will be seen in *fig.* 4, which represents part of a wheel with bevelled teeth acting into a grooved arbor, also shewn in section as in *fig.* 3. The point or lines of of this arbor, on which the tooth of the wheel bears, must be calculated as follows:—having ascertained what power or velocity we are in pursuit of, and the means of getting at the same, the arbor must be made of sufficient thickness to insure strength enough to resist what it has to bear, next the

distance of the bearing-point, or pitch-line, from the centre of the arbor, must be determined; and this may be taken at pleasure, except only that the tooth to act into it should not be made so long as to weaken it; but where greater length than ordinary is necessary, the teeth may be round bottomed, or else shaped as in *fig.* 4. The angle which the teeth of the wheel make with its axis, should be rather obtuse when the wheel is to be driven, and rather acute when it is to be the driver, which variation in angle will not affect the power of the gears, since this must always be in proportion to the diameters of the respective pitch-lines acting together, and the number of teeth will not be affected.

To determine the size of the wheel, it must be noticed that the arbor with its spiral groove, as above described, will make one complete revolution for each tooth of the wheel with which it is connected, consequently the wheel must have as many teeth as it is intended the arbor shall make revolutions for one turn of the wheel, and the distance between one tooth and another upon the wheel must be equal to three times the diameter of the pitch-line or circle of the arbor, therefore if this last-mentioned pitch line has been first determined as aforesaid, it will determine the size of a wheel to work into it with any assigned velocity, because we have only to multiply the diameter of such pitch line by three, and its product by the number of teeth or revolutions required to obtain the length or circumference of the pitch line of the wheel as sought, or, on the contrary, if the size and number of teeth of the large wheel be given, the pitch line of the arbor must be one third of the distance between its two teeth from centre to centre. In the construction of my aforesaid wheels it is evident that the angle which the teeth make with the axis of the wheel may be varied without varying the number of teeth in such wheel, but in this case the breadth of the face or periphery of the wheel must be altered, because in every case the inclination of the teeth must be so set out that lines drawn parallel to the axis of the wheel and to each other may touch or connect the centre lines of two contiguous teeth at their opposite ends, such line being parallel to the axis of the wheel *a*, fig. 1. and at the same time touching the lower end of the tooth *m*, and the higher end of the tooth *n*, the intention of this being, that so soon as any one tooth has passed the spiral groove in the arbor, and is just about to be withdrawn from it, the next succeeding tooth may be ready to enter and engage with it.

The spiral groove on the arbor must in every case be of a length corresponding with the breadth of the wheel with which it has to engage, and if the arbor is required to make one revolution for each tooth of the wheel, this groove must, in its length, traverse exactly once round the arbor. On the contrary, if two or more revolutions of the arbor are required to be made for each tooth of the wheel, then the spiral groove must extend twice or more round the arbor; but this is a construction I do not recommend, since to obtain additional velocity, it is always better to increase the size and number of teeth in the driving wheel; but where a slower motion is required in the arbor, it may be very well brought about by forming two or more spiral grooves, each extending half, or a quantity in proportion to their number round the arbor, and then letting them engage with two or more successive teeth to produce one revolution of the arbor. The curve of the spiral groove upon the arbor may be found by covering the edge of the wheel with a strip of thin paper, and marking the bevel of one tooth upon it, when the extension of that tooth may be cut off and wrapped round the arbor, which will give the form of spiral which may be marked and cut; but this is only a proximate method, and I recommend that the groove should be cut in a regular and proper engine for cutting screws or spiral grooves of this description; but as the process of cutting the spiral groove forms no part of my aforesaid invention, and is well known and understood by every competent workman, I shall not describe it, but will merely state that the smoothness and perfect working of my aforesaid improved gearing depends, like all other wheel work, on the perfect workmanship of the teeth and grooves, and their being well finished and fitted to each other.

I may also notice generally that as this gearing tends to produce a lateral bearing on the several arbors or axles employed in it, the friction of the pivots may be very greatly diminished, particularly in small and light work,

by making them revolve on central points instead of using points with shoulders working in holes, because in this way much smaller moving surfaces are brought into contact.

So far I have only described the manner in which my machinery or gearing is to be constructed and applied when the axes of motion of the different wheels and arbors are parallel to each other; but it will be evident that my aforesaid improvement applies equally when this is not the case, or to the construction of what are technically called bevel gears. The only difference in the construction in this case is, that instead of making the wheels and arbors true cylinders, which they should always be when used for parallel axes or arbors, that both the wheels and arbors must be conical to the same extent, and in the same proportion as is used for common bevel gear with cogs, the rules for which are well understood by mechanics. What has been said respecting the formation of my bevel or oblique teeth upon cylindrical wheels, equally applies to them when they are formed upon conical wheels; and the spiral groove in the arbor must be cut upon the conical part of it: but motion at right angles may be also communicated by means of a contrate or face wheel, with bevel teeth acting into an arbor lying in the same plane of the wheel, in which case its conical form will be determined by two radii of the wheel into which it is to act, to the intent that the smallest diameter of the part of the arbor where the spiral groove is cut may be in the same proportion to the diameter of the circle formed by the inside of the teeth, as the largest diameter of the pivot is to the diameter of the outside of the teeth.

One of the great advantages of my aforesaid improved combination of gears, is the simplicity which is thereby introduced into machinery, and the consequent diminution of friction, for since each tooth in the wheel will produce or be equivalent to an entire revolution of the arbor, a great saving in wheels may be effected: thus, for instance, if a common wheel has 100 teeth, and this works into a pinion of ten leaves, the same power or velocity may be obtained in my improved gearing, by using a wheel with ten teeth working into one spiral groove upon the arbor; as an example of which, *fig.* 1. is a side, and *fig.* 2, an elevation of a regulator clock, and which is capable of shewing hours, minutes, and seconds, and will *go for a whole year* with once winding up by a weight of only a few pounds: indeed, such is the variation in power and velocity which my aforesaid gearing admits of, that although the wheels may be large, and made to contain many teeth, yet they may be diminished in size and number of teeth to a single tooth, and if this is made to bevel or traverse once round the cylindrical or other wheel, in the manner of a screw, it will work into the spiral groove of another cylinder or conical arbor, as the case may be, and each of them will perform their revolution in the same time.

The objects which I claim as my particular invention and property are, therefore, not the wheel with bevelled or oblique teeth, or the endless screw in their separate and detached state, but the combination of them in the form hereinbefore described, in which the power of the screw is exerted in the direction of its radius instead of that of its axis, whereby I am enabled to apply my power much nearer to the centre of the arbor, than in any other modification of wheelwork, and thereby to obtain greater power or velocity than has hitherto been effected, and with much less friction, on account of the rolling motion that is induced instead of the rubbing one, and having only one point in wheel or arbor in action at once, and that always in the line of centres, which, together with the power that I possess of giving strength to my arbor, constitutes an entirely new system of gear work requiring less space, less materials and consequent weight, less labor for its construction, and less friction when completed, than any other gear work hitherto constructed. In Witness, &c.

The preceding engravings, as mentioned above, shew the application of these new and beautiful principles to the improvement of horological instruments; In our 50th number, page 27, its adaptation to cranes is described; and it is no less so to every machine in which rotatory motion is produced by means of wheels and pinions. We could say much more on this interesting discovery had the ably written specification said less, which is a document and a subject well worthy of repeated perusals.

MISCELLANEOUS INVENTIONS,
Discoveries, & Processes in the Useful Arts.

French waterproof Cloth or Silk.—The following is the process adopted by M. Collet. Take 1lb. of linseed oil, 1½lb. of white lead, 1oz. of umber, and a clove of garlick; boil these ingredients for twelve hours over a slow fire, and when the surface of this composition acquires a skin upon its surface, it is fit for use. The cloth or silk is then to be immersed being previously spread over a frame, then hung up to dry, and afterwards rubbed smooth with pumice stone.

The material is next to be coated with another composition prepared in the following manner. Take one pound of linseed oil, one ounce of litharge, four drams sulphate of zinc, and four ounces white lead calcined to a yellow colour; boil these in an iron pot until they assume the consistence of paste. This preparation is then to be spread over the cloth on one side of it, and then dried in a heated chamber. For covering of silk this last operation should be repeated. Oiled skin cloth, perfectly flexible and waterproof, is thus produced.

Potatoe Paint.—A very useful paint for palings, gates, and other coarse work, may be made with the following cheap ingredients. Take a pound of potatoes, that have been deprived of their skins and well baked: mash them in three or four pounds of boiling water. To this add two pounds of powdered chalk mixt previously with four pounds of water, stir the whole well together, and then pass the mixture through a hair sieve. In this manner will be formed a gluey kind of paint, well adapted for coarse purposes and capable of receiving any colouring ingredient.

Phosphorescence of Potatoes.—Lichtenberg tells us, that an officer on guard at Strasburg, on the 7th of January, in passing the barracks, was alarmed on observing a light in one of the barrack-rooms. As this was strictly prohibited, fire was suspected, and he hurried forward to the apartment. On entering it, he found the soldiers sitting up in bed admiring a beautiful light which proceeded from potatoes in an incipient state of putrefaction. The light was so vivid, that the soldiers could see to read by it; it gradually became less and less vivid, and entirely disappeared by the night of the 10th of the month.—*Jameson's Journal.*

Paste for sharpening Razors.—Take a quantity of slate, wash it well, pound it in a mortar, and pass it through a very fine hair-sieve; mix some of the powder, first with well-water, and afterwards with olive oil to the consistence of fat. Put some of this paste upon a common razor strop after it is has been properly cleaned, so as to remove all foreign bodies from it. Pass the razor from right to left, as usual, ending with raising the back a little, and a perfect edge will be obtained.

Certain Cure for the Sting of a Wasp.—*From the Liverpool Mercury, of the 23rd Sept.* "A few days ago, happening to be in the country, we witnessed the efficacy of the remedy for the sting of a wasp, mentioned in one of our late publications. A little girl was stung severely, and was in great torture, until an onion, a young scallion, was applied to the part afflicted, when the cure was instantaneous. This important and simple remedy cannot be two generally known, and we pledge ourselves to the fact we have stated."

New Hydraulic Machine.—"Sig. Gioacchimo Mortala has constructed a machine, by which it is said he has raised the running water 250 palms above the level of the great court yard of the Basilica Vaticana." If this is effected by any novel or extraordinary means, the fact might then be worthy of the notice the public papers have taken of it, but they have not indulged us with any explanation of this assumed discovery.

New Plough.—A Farmer of Slippeback, in Moravia, has recently invented a new Plough, by which he makes three furrows at a time, by the power of one horse. The society of sciences at Vienna have in consequence awarded him with a gold medal.

Enormous Telescope.—The celebrated optician, Strayel, of Bale, has just invented a new telescope, sixty-four feet long; by the aid of which it is said several learned persons have been enabled to discover animated beings, roads, monuments, and temples in the moon.—*Monthly Magazine.*

Construction of Chimneys.—In Mr. Tredgold's work on the Warming and Ventilating of Apartments, he recommends the following proportions for the orifices of chimneys according to the height and magnitude of the fire-places.

Multiply by 17 the length of the fire-place in inches. Divide the product by the square root of the height in feet; and the chimney above the fire. The quotient will be the area of the upper orifice in square inches.

Thus, if the fire is 15 inches wide, and the height of the chimney 9 feet, we shall have $\frac{17+15}{7} = 36\frac{3}{7}$ inches, which is a rectangle of $6+6$ inches, in a circle of nearly 7 inches in diameter.

In chimneys already built, the upper orifices may be contracted to their proper size by Roman Cement. The contraction of the lower end of the vent should be nearly the same as the upper orifice, and the throat or lowest opening should not exceed the length of the bars. The length of the front of the fire should be an inch for every foot of the room's length, and the depth one half of the length. If the length of the chamber should be such as to require a grate more than 30 in. long, *two* fire places should be constructed.

Light and Heat.—From a series of experiments made by Mr. Baden Powel, detailed in Brande's Journal, it appears that when light is absorbed and enters into combination with other matter, heat is

given out; on the other hand, light is not generated or revolved, without the application of a certain degree of heat. All bodies at some temperature become luminous, and when they arrive at that point, a portion of heat seems to be employed in giving the form of light.

An hydrous concrete Sulphuric Acid.—This has been recently obtained by that celebrated chemist Dr. Ure, by distillation from the brownish coloured oil of vitriol, made at Nordhausen. It is of a tallowey consistence, and burns holes through paper upon being touched with it, as rapidly as if red-hot iron were applied; and when dropped into water it causes a violent ebullition.

Glass for Optical Instruments.—With the view of discovering a purer medium through which to make astronomical and nautical instruments than the glass at present manufactured for those purposes, a series of experiments, under the direction of the Royal Society and Board of Longitude, have been commenced, and are zealously continued with the hope of accomplishing so desirable an object.

Action of Animal Poisons on Plants.—As some of the organs of plants have a striking analogy with those of animals. M. Marcet has been induced to make a series of experiments with all the principal mineral and vegetable poisons, by introducing a portion of them among the circulating juices of a great variety of plants; from all which experiments it was satisfactorily demonstrated, first, that the metallic poisons act on vegetables nearly in the same manner as they act on animals. They appear to be absorbed, and carried into the different parts of the plant, and to alter and destroy the tissue of it by their corrosive power. Second, that vegetable poisons, and particularly those which are demonstrated to destroy animals by their action on the nervous system produce also the death of plants. See *Brewster's Journal*, vol. iii. p. 293, where the experiments are successively detailed.

Transfusion of Blood.—The extraordinary operation of taking blood from the veins of one individual, and injecting it into those of another, was lately performed by Dr. Blundell, lecturer at Guy's Hospital, upon a poor woman aged twenty-five years. She was to all appearance dying from loss of blood, when Dr. Blundell (seeing the imminent danger of the case) laid bare one of the veins of her left arm, taking care to prevent the blood flowing from the orifice. The husband of the woman, who was a robust man, was then called in, and two ounces of blood taken from his arm into a glass tumbler; this blood was then by means of a syringe, slowly thrown into the vein of the woman, in the direction of the heart, and the same quantity immediately after repeated. In about ten minutes the woman rallied, and gradually recovered from the jaws of death. The syringe was of brass, and well tinned in the inside, to the mouth a pipe was fixed, of about two inches long, and the size of a crow's quill, shape like a pen at the end with a blunt point. All air was carefully expelled from the syringe when used.

Employment of Caustic to destroy the variolous Eruption.—M. Velpeau read a memoir to the Royal Academy of Medicine, tending to prove that if the pustules of the small pox are cauterized within the two first days of their appearance, they die away entirely, and if this is done even later, their duration is abridged, and no traces of them are left. The caustic he employs is a solution of nitrate of silver, in which he dips a probe, with which he pierces the centre of each pustule. M. Dumerel says that he has been long familiar with this practice, but instead of the solution he employed the solid caustic itself.—*(Archives Générales.) Med. Jour. Liv.* 170.

Anatomical Preparations.—For preserving anatomical preparations and retaining the spirit, it has been recently recommended by Dr. M'Cartney, of the Dublin University, to employ a covering of caoutchouc (Indian rubber) stretched over the necks and tied down, and afterwards varnished. Owing to the great flexibility and impermeability of this substance, it allows of the expansion of volume of the contents of the jars, which takes place by an increase of temperature.

Devil's Tree.—This name has been given to a tree growing in America. Its fruit in a mature state is elastic, and when dried by the heat of the sun it splits with so great a noise, as to be compared to the report of artillery, and by its bursting the seeds it contains are widely scattered. The same effect takes place if the fruit is collected and dried artificially.

American Geography.—A volume of 1200 pages of the Geography of the United States, has recently been published in Germany. A reviewer of this work, in the Revue Encyclopedique, observes that the Americans shew a remarkable partiality for particular names. There are, already in that country, 20 Fairfields, 10 La Fayettes, 19 Monroes, 42 Franklins, and 55 Washingtons. "It is impossible" the writer says, "that 55 Washingtons shall not confound geographers, and set the clerks of post-offices into an ill humour with the great man who has left his name to so many towns and villages."

Society Islands.—A sugar manufactory has been established at Otaheite, where the cane grows naturally. A cotton manufactory is likewise being erected at Eimeo, where cotton grows spontaneously and abundantly; the machinery is of English manufacture, and the motion is to be given by water power.

The Hide of the Sea Horse.—When dried and shrunk up may be considered to average fifteen feet in length and thirteen feet in breadth, and rather more than one inch thick, that being the measurement of the Sea Horse killed in Orkney.

QUERIES.

By O. P. H.—"What is the best method of making a bright and lasting red ink."

By J. B.—"I have observed that both the blue and yellowish brown clay when made into bricks, and burnt or baked, turn red.

Now I wish to know by what process bricks are made yellow throughout; and whether yellow bricks may not be made from the same clay that produces the red bricks, by some previous simple chemical treatment, which would much enhance their value?"

By T. W. H.—"Whether any cheap, easy, and *effectual* means are known for extirpating those filthy and disgusting vermin, the bugs, from houses and apartments infested with them; and if so, what are they?"

By N. B.—"In your fifty-first number you permitted me to suggest the possibility of generating steam in warm climates by means of large burning glasses, and as I think their usefulness may be extended much further, I beg to enquire whether they could not be used successfully in warm mining countries for the reducing of ores to their metallic state. I trust the hints I have given will induce some person to make experiments (in relation to these subjects) with this powerful but long neglected instrument. N. B."

LIST OF NEW PATENTS.

CORDAGE.—To C. Dempster, of Laurence Pountney Hill, London, for improved cordage. Sept. 15th 1825.—Six Months.

NAVIGATION.—To G. H. Palmer, of the Royal Mint, Engineer, for a new arrangement of machinery for propelling vessels through the water. Sept. 15th.—Six months.

CARPETS.—To Adam Eve, of South, Lincolnshire, for improvements in manufacturing carpets, which he intends to denominate Prince's Patent Union Carpet. Sept. 15th—Six months.

SURGICAL INSTRUMENT.—To Isaiah Lukens, of Adam Street, Adelphi, for an Instrument for destroying the stone in the bladder without cutting, which he denominates Lithontrepton. Sept. 15th. Six months.

NAVIGATION.—To Sir Thomas Cochrane, Knt. (commonly called Lord Cochrane,) of Tunbridge Wells, Kent, for a new method of propelling ships, vessels, and boats at sea. Sept. 15th.—Six months.

STOVES, &c.—To Charles Jacomb, of Basinghall Street, London, for improvements in the construction of furnaces, stoves, grates and fire places. Sept. 15th.—Six months.

TO OUR READERS AND CORRESPONDENTS.

Our next Number will contain a great variety of new Patent Inventions.

We are sorry to decline the insertion of any thing from the pen of so respectable a correspondent as T. W. H., whose observations in his second letter, however excellent, would occupy too large a space in our columns, which we are anxious to devote almost exclusively to the giving of real practical information. His first letter, and the query contained in the second we readily insert.

The communications of AN ARTIZAN and R. S. we hope to find room for in our next number.

We cannot say that we entirely understand N. B's. paper on his new application of the thermometer, but as far as we do comprehend it, it appears to be too indigested for publication. The table seems to be calculated upon no certain data,—but we will give the matter further attention.

J. S.—and Arithmos will be inserted in our next number.

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REGISTER

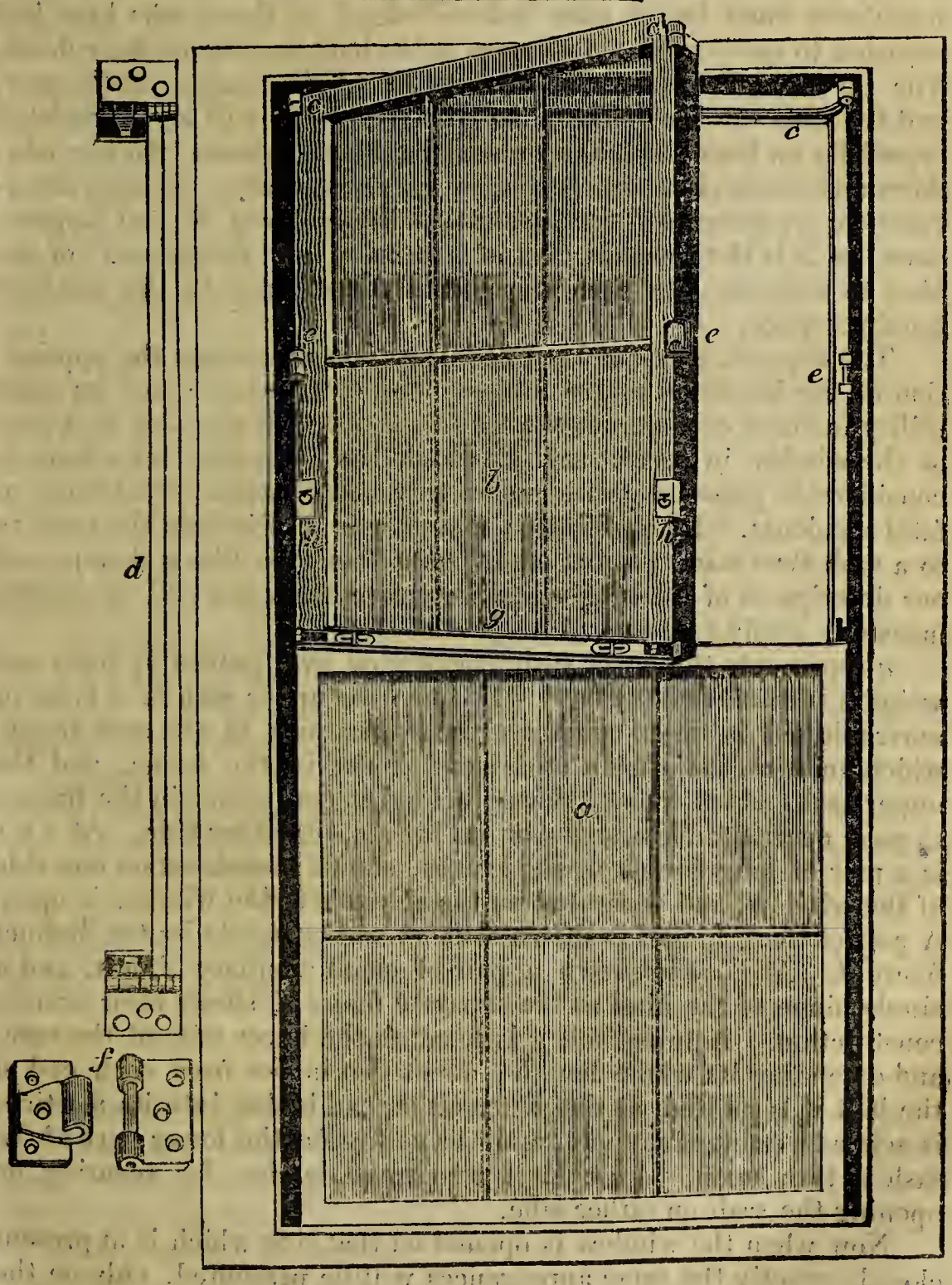
OF

THE ARTS AND SCIENCES.

No. 55.] SATURDAY, OCTOBER 22, 1825. [Price 4*d*.

CONTENTS:

Whitechurch's Patent Hinges - - - 98
Lamp Chimney Glasses - - - - 99
Atlee's Patent Condensed Wood - - 100
New Smoke-consuming Stove - - - 102
Perkins's Patent Evaporating Apparatus - 103
Jeffery's Patent Condensing Flues - - 104
Leahy's Patent for the Drying of Bricks - 105
Rhodes's Patent Brick Clamps - - - ib.
Evans's Improved Coffee Urn - - - 106
New Mathematical Instruments - - 108
On the Oil of Teak - - - - - 110
Partial Conversion of Iron into Steel - ib.
Close Imitation of Gold, Do. of Platina - 111
Arithmometer,—Patents, Correspondence, 112



WHITECHURCH'S PATENT HINGES,

FOR ENABLING DOORS AND WINDOWS TO BE OPENED EITHER ON THE RIGHT OR LEFT JAMB, AT PLEASURE.

WHITECHURCH'S PATENT HINGES,

FOR ENABLING DOORS AND WINDOWS TO BE OPENED EITHER ON THE RIGHT OR LEFT JAMB, AT PLEASURE.

It is not easy to imagine how a door can be hung so as to be opened either on the right or left hand with equal facility and security; yet this has been done most completely by the patentees, Messrs. R. & J. Whitechurch, Builders, of 85, Chancery Lane. Their counting-house door is hung in this manner, which not a little puzzles the inquisitive stranger. It is, indeed, a most ingenious contrivance, and its usefulness must be at once acknowledged by those who have had occasion to make repeated changes in the hanging side of their doors. The invention is however applicable to *window-sashes*, *book-cases*, and the *show-cases* of shops; but its advantages will be appreciated especially on board ships, in packets and steam-boats, for the windows and doors of cabins, and other confined places. In such situations we are persuaded the invention will be found of real importance, as it is the constant task of ingenuity in "fittings-up" of the kind to embrace the utmost possible convenience in the smallest possible space.

The engraving at the head of this article represents the application of the invention to the sash-windows of houses; and its chief utility in these consists, in the facility afforded of cleaning that part of the window in perfect safety, which has heretofore been done at considerable personal peril, and in very many instances the cause of fatal accidents. Its application to a door is in principle the same as to a sash thus made (which opens on either side like a door), and our description of the hinges and fastenings therefore will, in a great measure, apply to both.

a represents the lower sash, suspended over pullies by lines and weights in the usual manner. To open the upper sash *b*, a false or moveable sill is taken out from the lower part of the sash frame, which enables the sash *a* to descend lower in the frame, and the upper sash, which was previously behind it (or deeper in the frame) to pass over it, and to swing on its hinges, on either side. At *c c c* is a pair of long double-acting hinges, shown connected on one side of the window, and separated on the side where the window is open. A pair of these hinges is shewn shut up and complete by the distinct figure *d*. At *e e e* is shewn a pair of small auxiliary hinges, and a single hinge of the kind at the separate figure *f*, shews their precise construction. A brass bolt *g* is fixed on the lower stile of the sash, and extending its whole length; about two inches from each end of the bolt it is jointed, so that when either end is shot into its mortice, it acts as a point of support, and as a centre for the lower part of the sash to turn upon. *h h* exhibit two small latches for securing or opening the sash on either side.

Now when the window is opened on that side which is at present closed, exactly the same appearances will be presented, only on the opposite side. It is therefore clear that the hinges must alternately separate and connect themselves at the joints. The manner in

which this is done will be partly understood by reference to the separate figure *f*, where each flap of the small secondary hinges are shewn apart, and that they connect themselves by the jointed parts of one flap hooking into the other. The long hinges used in the upper part are, however, of a more complex nature, and we doubt our ability to give an intelligible description of them, without the aid of several more figures giving different views of their parts, with which our draftsman has omitted to furnish us. Any person, however, who may be desirous of investigating their principles and mode of action, will, we doubt not, have every facility afforded them at the office of the patentees.

In applying the invention to a room door, the arrangement is somewhat different; the long hinges are placed at top as in the case of the window sash, and the small auxiliary hinges are fixed near to the bottom. On the middle stile of the door the bolt, or locking bar, is situated, which is either let in flush with the door, or lies in a mortice passing from one side to the other, and is consequently entirely out of sight. A mortice lock is placed on each side of the door, for opening and shutting it by means of the knobs, and the bolt springs to and fastens the door itself when shut, in the ordinary way; and when it is required to open the door the contrary way to that which it was the last time, an extra half turn of the knob throws back the bolt and locks the opposite side. It is thus opened on either side instantaneously, and is hung on the opposite side at the same moment with never-failing security. The door is, in fact, more securely hung, is better supported, and, consequently, turns on its hinges with greater ease and smoothness. It cannot be taken off its hinges without the aid of a turn-screw, as any other door.

It will be readily understood, that motion is given to the locking-bar by a small tongue or lever in the mortice lock on either side; a stranger, therefore, on taking hold of either of the knobs opens the door in the ordinary way.

According to the present unscientific construction of our fire-places, and the great draughts that are produced towards them on the opening of the room doors, the comfort of the persons sitting in the room materially depends upon the direction in which the doors are opened, and if it should be desirable to place any article of furniture in a situation that would obstruct the opening of the door on one side, it may be opened on the other.

LAMP CHIMNEY GLASSES.—As these glasses frequently break owing to an inequality of thickness, and consequent irregular expansion by heat, it has been recommended by M. Cadit de Vaux as a means of preventing this effect, to make a cut with a diamond in the bottom of each cylinder. By observing this precaution in an establishment where six lamps with such glasses are lighted every day, M. C. de Vaux states that not a single glass has bursted during nine years. *Bull des Sci.*

THE PATENT CONDENSED WOOD.

" To the Editor.

" Sir,

" Through the medium of your valuable and widely circulated columns, I am desirous of introducing to the consideration of the public, a description of the patent I have recently obtained, for the condension of wood. In submitting my sentiments upon this subject, to the ordeal of scientific criticism, by which the merits of the invention will be either acknowledged or disapproved, I have the satisfaction of declaring that my own opinions have not been hastily formed, but that they proceed from long investigation, and have received the approving sanction of eminent and experienced engineers.

" The mechanical process of condensing timber is effected by passing a plank through a rolling press, by which operation every particle of mucilaginous juice is completely extracted. By thus destroying the porosity of the wood, and expelling the vegetable mucus, the interstices are effectually and permanently closed. It may thus fairly be presumed, that a plank of condensed timber, being purified from all those qualities which generate putrefaction, is secured, and rendered proof against the destructive influence of the dry-rot. Chemistry teaches us, that the decomposition of matter, in other words putridity, is almost entirely occasioned by the action of air. In proportion as the atmosphere is heated, stagnant, and moist, fermentation proceeds, and it necessarily and obviously follows, that the decomposing power of the atmosphere, will be more essentially exerted on a porous substance, than on one whose component interstices are more closely rivetted together, and which altogether presents a harder, and more impervious resistance.

" It is precisely to effect this object, that my patent is calculated, by converting a juicy, porous, and spongy material, into a durable, firm, and solid substance. I am also convinced, from repeated experiments, that a plank of condensed timber will never shrink or expand, which for building purposes, such as laying floors, pannels, &c. must be of the first importance; and I should recommend a coating of oil to be smeared over the plank, in some instances, before it passes through the rolling press, which will not only more effectually close up the interstices, but prepare the wood for receiving a higher polish, for various purposes: as, for instance, the painting of arms, or crests, on the pannels of carriages, and other descriptions of fine painting.

" In naval architecture I flatter myself with the hope of being able to introduce a most valuable improvement in the articles of trenels. I propose to pass them through steel tube plates, to any required guage, by which process they will be of one uniform dimension, and, in all probability, may supersede the use of copper bolts. Under the present system it is utterly impossible to produce any regular equality in the size of trenels, but by the aid of my invention every species of wood, in proportion to its natural texture, may be accurately and unerringly condensed from ten to fifty per cent.

"Musical instrument-makers, particularly in piano-fortes, will derive a considerable advantage from the using of the condensed timber, which will not only remove the necessity of warehousing large quantities of wood, for the purposes of seasoning, but the tone of the instruments, especially in sounding boards, will be materially improved.

"I may also anticipate success in every article of furniture in which cabinet makers are concerned, book-cases, wardrobes, &c. for instance, constructed of condensed wood, will never shrink, nor can the doors ever swerve from their original positions. By this process a polish may also be given to mahogany which approximates it to the clearness of a mirror.

"All wood intended to undergo the operation of veneering will receive a manifest superiority by condensation, in as much as the material will become perfectly pliant. You may form some idea of the extraordinary power of the rollers, when I state to you, that a piece of veneered wood may be rendered so extremely flexible, as to admit of being tied in a knot. I could not without occupying too large a space in your Register, enter into the complete details of my patent, or particularize the various and remote ramifications to which it may extend.

"But from the preceding observations it may be perceived that I contemplate a decided improvement in the durability of all descriptions of timber, to whatever purposes applied. After several interviews with the navy board, I have received every assurance of support; and many of the most eminent musical instrument makers have encouraged me with the most flattering prospects of decided success. I have only to add, that the machinery and steam engine are nearly completed, and that in the course of a month or six weeks the merits of my patent will be submitted to the test of experiment on the large scale.

"*Marchwood,* "I remain, Sir,
"*Southampton.* "Your most obedient servant,
"*October 6th.* 1825. "JAMES F. ATLEE."

N. B. [We have seen some samples of wood, condensed by the above patent method, and were much surprised at their improvement in solidity, strength, and beauty. Some pieces of 7-8 inch plank of Honduras mahogany was reduced by the operation to 7-16, or to one half, and consequently its weight, or rather its specific gravity, was greatly increased; the texture of the grain was so much altered, as to resemble fine Spanish mahogany, to which, indeed, it must be vastly superior in durability and strength. Thinner pieces were reduced in a similar ratio, and were almost as elastic and supple as leather; and some samples of rose wood which had undergone the compression with their surfaces oiled, had acquired highly polished and smooth surfaces. The invention upon the whole promises the most valuable results, and claims the attention in particular of those classes of manufacturers, mentioned in the preceding letter.] Ed.

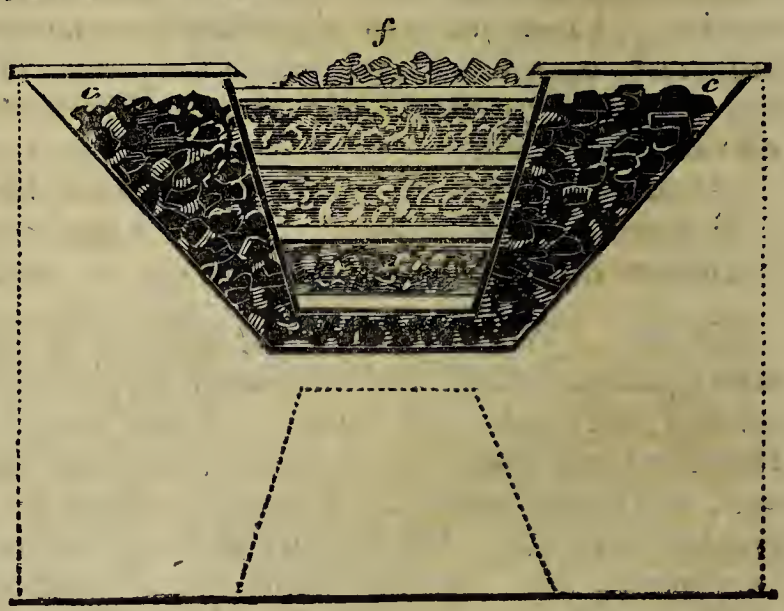
NEWLY-INVENTED SMOKE-CONSUMING STOVE.

" To the Editor.

" RESPECTED FRIEND,

" I LIVE in a house so situated that the apartments are invariably annoyed with smoke during the prevalence of certain winds, which having subjected myself and family to much inconvenience, I have been led to consider of some remedy for so unpleasant an evil. Being very little acquainted with the principles of combustion, I have formed plans from time to time which intelligent friends shewed me the errors of, either as regarded their impracticability or inefficacy. I had almost given up the attempt as beyond my ability to effect, when a plan suggested itself to me, which I have had put into practice, and finding it to answer the purpose extremely well, I hasten to inform the public of it through the medium of thy Journal of useful Inventions.

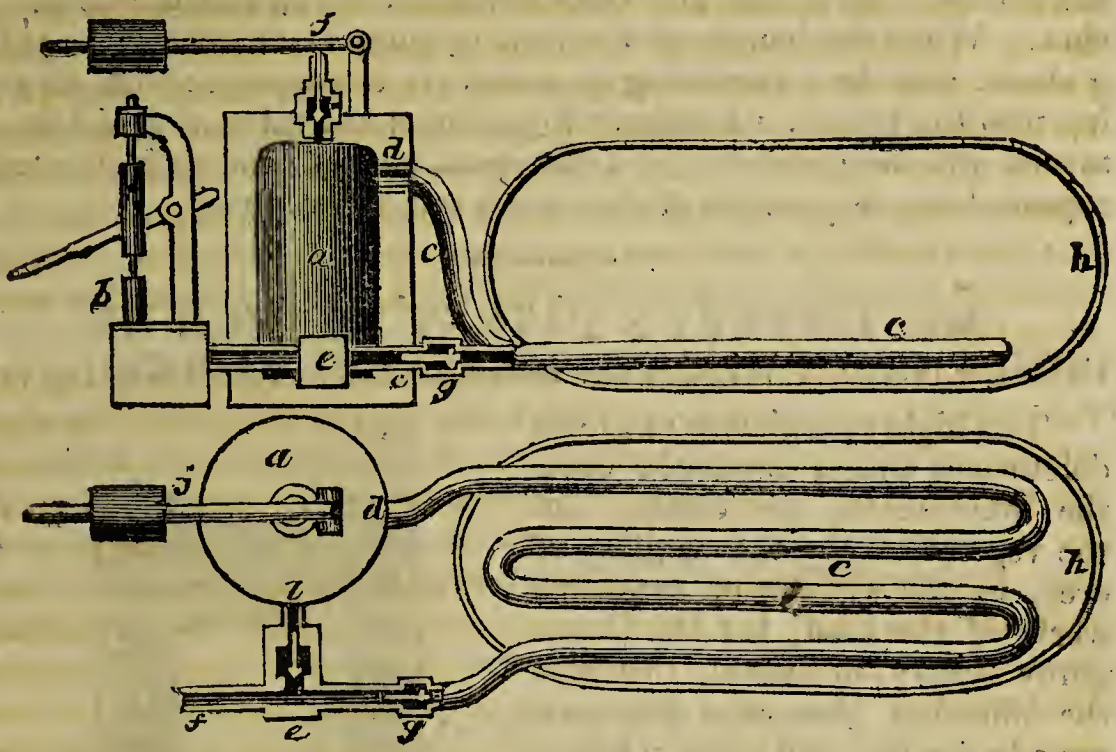
" I had observed that when pieces of fresh coal were inserted in the hollow parts of the fire, at the lower part of the grate, the smoke which issued from them inflamed in its progress upwards through the burning fuel. I therefore directed the fire to be made always in the morning with fresh coals at the bottom, and with cinders at the top; but as the cinders contained amongst them portions of small coal and coal dust, the smoke that arose from them did not inflame. The evil was therefore not to be thus entirely overcome. I therefore had recourse to a new construction of stove, by which the coals might be always supplied at the bottom of the grate, and the inclosed diagram will cause thee to understand it.



" The stove is made exteriorly of the usual form, excepting that the fire part, *f*, is of greater length or height than is common, and the spaces under the hobs are made into reservoirs to receive the coals (as shewn at *c c*) for supplying the fire. The hobs are upon hinges, and form lids, which shut down very closely; if air-tight the better. The cheeks of the grate are open at the bottom, so that the coals lying upon the inclined plane of the reservoirs descend by their own weight, and occupy the lower part of the grate, and as the fuel is consumed, or raised by the poker, a fresh portion of coals enters from either or both of the reservoirs, and fills up the space. In this manner the fuel is constantly supplied, occasioning little or no smoke. The reservoirs should be of a capacity sufficient to hold enough coals for the day's consumption.

"I shall here conclude with observing that I hope many other persons will derive the advantages that I have from this very simple invention.

"I am, with respect,
"*Kennington Common,* "Thy Friend,
"11-10*th Month*, 1825. "RACHEL SMITH."



MR. PERKINS'S PATENT MODE OF EVAPORATING LIQUIDS, BY STEAM UNDER HIGH PRESSURE.

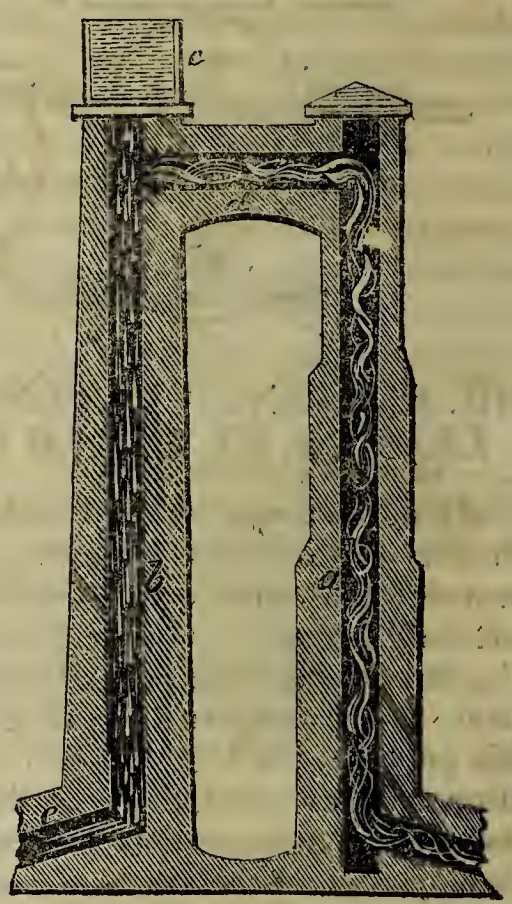
In our account of Mr. Perkins's Patent Steam Engine in the 21st Number of this work we gave a description of his steam generator, in which the water is confined under great mechanical pressure, and intensely heated, by being placed in the midst of the burning fuel of a furnace; and the present patent is for an adaptation of that apparatus, to the purpose of boiling and evaporating other fluids. For this purpose, the high pressure steam is projected from the generator through pipes which circulate through the evaporating pans or boilers, and such an arrangement is made, that the water produced by the condensation of the steam, is returned into the generator by means of valves and a forcing pump, the steam or water being always under mechanical pressure.

The engravings give a sectional elevation and a plan, and the same letters of reference apply to similar parts in each figure. Thus *a* (*Fig.* 1.) is the generator, *b* the forcing pump, *c c* is a pipe opening into and projected from the upper part of the generator at *d*, and opening to and projected from the lower part of it opposite to *e*. *f* is a pipe leading from the pipe *c* to the forcing pump: *g* is a valve, *h* is a vessel containing the liquid to be boiled or evaporated, and *j* a safety valve. In this plan, *fig.* 2. the same parts, with the exception of the pump, are shewn, and in addition, a valve near the opening

into the generator at *l*, which is in a line with the part marked *e* in the elevation.

When steam is admitted from the generator into the pipe *c c*, it becomes condensed in heating the surrounding fluid in the vessel *h*, and collects in the form of water at the valve *g*. Upon raising the handle of the forcing pump, the valve *g* opens, and the water fills that portion of the pipe marked *f* between the pump and the valve *g*, the pressure from the generator keeping the valve at the opening *l* shut. When the handle of the forcing pump is depressed the valve *g* shuts, and the water being prevented in consequence from returning into the pipe *c*, necessarily forces open the valve at *l*, and is returned into the generator, and this operation is of course successively repeated at every stroke of the piston rod of the pump.

MR. JEFFERY'S PATENT METHOD OF CONDENSING SMOKE, METALLIC VAPOURS, &c.



The highly pernicious and even deleterious effects produced upon the inhabitants, the cattle, and the vegetation, by the smelting of ores, in the vicinity of extensive works of the kind, led Mr. Humphrey Jeffery, of Bristol, to devise the following plan of a flue as a remedy for the evil; for which a patent was enrolled about six months ago.

The annexed figure gives a vertical section of the patent flue. *a* represents a common flue proceeding from any description of furnace; the top of which being closed the vapour proceeds along the horizontal branch *d*, into the condensing shaft *b*; on the top of this second shaft is placed a cistern of water, the bottom of which is perforated with numerous small holes; and being duly supplied with water, a constant shower like fine rain is produced whilst the furnace is at work. The showering of the water causes a strong draft, by which the vapour is drawn into the current, and immediately condensed. The several matters thus condensed run off along with the water through the passage *e* into recipients suited to the nature of the products obtained by the operation. When only one common wall divides the smoke passage from the condensing shaft, a hole through the wall of the same area as the chimney will answer equally well.

This invention is unquestionably most excellent and effectual, and the advantages attending it must be very great, where a sufficient supply of water can be obtained.

MR. LEAHY'S PATENT METHOD OF DRYING BRICKS.

(Continued from page 84, No. 54.)

The specification, after describing the moulding machinery, proceeds to recite two methods for drying the bricks. The first by means of heated flues, and the second by the aid of steam conveyed through cast iron pipes.

In the former a drying house is to be furnished with proper stages, and shelves for the bricks to be laid upon are to be provided. Around and across the lower part of these, flues framed either of brick or cast-iron are to be placed; through which flame or heated air from proper fire-places is to be conveyed, and the heat from thence circulating among the bricks, it is presumed will dry them ready to be afterwards baked in kilns, and in a much shorter time than by the ordinary method in the open air, and also in winter as well as in summer.

In drying by steam, the vapour is conveyed from the boiler through cast-iron pipes throughout the drying house, and boards are arranged upon stages (similar to those shewn by the separate figure in the frontispiece of our last number) so as to leave intervals between the rows of bricks, and so that they shall not touch each other. The pipes are to be so placed as to convey the condensed steam or water back into the boiler.

MR. W. RHODES'S PATENT

FOR AN IMPROVED CONSTRUCTION OF CLAMPS FOR THE BURNING OF BRICKS.

The usual method of constructing a clamp to burn raw bricks after having made the foundation and flues with common burnt bricks, is to place the raw or unburnt bricks tier after tier over each other, edgewise, but crossing each other lengthwise (*i. e. breaking the joints*, as it is termed). A layer of cinders (called breeze) is placed between each course and between every interstice. The clamp thus formed is enclosed by a wall of common burnt bricks, and the top is covered in by several layers of the same kind of material; the first three or four courses of these coverings are laid flat-ways and close together, breaking the joints each course, these are called *cantlings*; and in the next three or four courses the bricks are placed edgewise, crossing each other as before-mentioned; these are called *plattings*.

These cantlings and plattings are intended to protect the raw bricks from the rain, which they do effectually, it is said; (we presume by their absorbing the rain, as they throw off little or none): Mr. Rhodes has however observed, that they are productive of a concomitant evil, which it is the object of his patent to remedy.

When the fires are first kindled in the flues, the steam ascending from the lower tiers, condenses upon the upper, in consequence of their being in a comparatively cold state; bricks thus wetted can never be burnt hard, and are of very inferior value. To prevent this effect, and to allow the vapour to escape freely, the following

arrangement has been proposed and successfully adopted by the patentee.

The last two or three courses in the upper part of the clamp are placed about half an inch apart, and the interstices filled with breeze. Over these only one course of cantlings are placed, with intervals between them of the size of pigeon holes. Over these are placed three or four courses of plattings, the lowest course of which is *pigeon-holed* across the clamp in lines about 14 feet asunder, and the whole is covered with three or four inches of a compost, or brick dust. By this arrangement the steam has a free vent through the pigeon-holed passages, and it is prevented from condensing upon the upper courses by the burning breeze between them, by which they are also burnt more completely, while they are equally defended from the rain.

EVANS'S COFFEE URN.

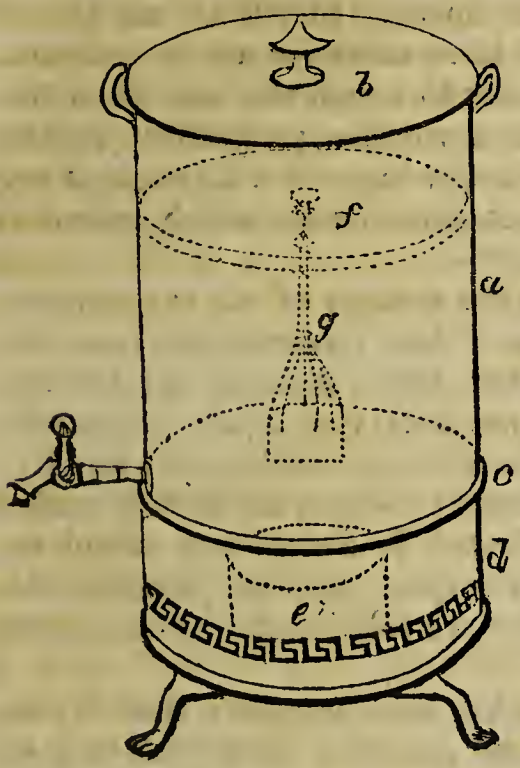
Lest the hasty reader should pass by this subject with only a glance, under the supposition that it merely relates to a slight improvement in an ordinary culinary utensil, we think it proper to observe in the commencement, that the principal or novel feature in the invention is of much more importance than at first sight it appears to be, on account of its applicability to other useful purposes, besides that of making a superior cup of Coffee; of which we shall speak after having described its present use.

In the ordinary method of roasting coffee, it is well known to chemists, that an acetous acid is generated; and when the berry is subsequently ground and infused, this acid is given out in a great or less quantity, according to the time the coffee remains in the liquor. To obviate this inconvenience, an apparatus was contrived (called a *biggin)* in which the coffee is put into a bag suspended to the rim of the vessel, and boiling water having been poured through, it is separated from the liquor as soon as the infusion is made. In this manner an infusion is produced nearly free from acid, and possessing much of the aromatic fragrance.

In the coffee roasted by the *patent* apparatus, the ingenious inventor has contrived in his process to get entirely rid of the acetous acid, which is the necessarily resulting product of the operation of roasting; it follows therefore that in making an infusion of the patent coffee, there is no necessity for keeping the water separate;—and, consequently, that an infusion of a much richer quality may be obtained by allowing the powdered coffee to lie a considerable time immersed: and hence it has been observed, that the last cup is better than the first, while it is the contrary in ordinary coffee.

Now the process adopted with the biggin is an uneconomical one, as the water being merely poured through the powdered coffee, or immersed for a short time, dissolves only a small portion of the soluble matter; consequently much of the rich properties are abandoned to avoid the acid and retain the aromatic parts. In the patent coffee there is no acid to be extracted, therefore the infusion may be con-

tinued until all the nutritious matter is obtained from it; but as the fragrant principle is of a very volatile nature, and as the retention of it to the greatest extent is a desideratum in coffee-making, Mr. Evans has contrived the apparatus* delineated below, which answers the purpose extremely well.



a shews the body of the vessel to be of a cylindrical form, *b* is the cover or top, and *c* the bottom; *d* is the stand, containing a cylindrical recipient for a lamp or a heater; *f* is an air tight *floating* piston, with a hook underneath, for suspending the bag of ground coffee *g*.

The floating piston is made of two thin metal plates, with a hollow space between them, capable of holding a sufficient quantity of air to render itself and the bag of coffee buoyant; the peripheries of the plates are connected by a rim at right angles, and properly soldered. The piston is of course accurately fitted to the cylinder, but so loosely as to allow it to rise and fall with the liquid on which it rests quite freely. By this means the surface of the liquor is preserved from the contact of the air, and notwithstanding the liquid is at a boiling heat, no perceptible vapour arises, which might be supposed would escape by the edges of the floating piston; the aromatic principle is thus wholly retained, or very nearly so, until the last cup of coffee is drawn off. The air having no access to the liquor, it boils at a lower temperature, and is kept hot for a much longer time.

When coffee is ground to a fine powder, and placed loosely among the water, the floating particles are a long time in subsiding; in such cases the addition of a small quantity of animal gelatine is resorted to, to expedite the clearing, and to save the trouble of this operation, the suspending of the coffee in a bag was introduced. Mr. Evans has however found, that when coffee is thus suspended in a mass, that a great portion of the extractive matter remains in it undissolved; he has therefore suggested a further improvement, and is now, we are informed, having an urn made accordingly. In this the coffee is to be contained in a cylindrical box, which is to rest upon a ledge at nearly the bottom of the urn, occupying the whole of its area; the top and bottom of the box to consist of two fine strainers, similar to those used in sieves. The water will be supplied by means of a tube extending from the top of the vessel to the bottom, from whence it will ascend through the strainers and the coffee contained between

* Made by Mr. Slark, of Cheapside, where we believe they may be obtained.

them, which being unconfined, every particle will be kept in agitation by the boiling water, and fully operated upon. The floating piston, which is by far the most valuable part of the invention, will of course be employed in this improved modification, as in the one previously described.

Having now stated the uses of the floating piston in making a superior infusion of the patent coffee, it remains for us to mention its advantageous application to all liquors to which the contact of the air is detrimental. All such as possess volatile properties, among which are included all malt liquors and wines, and all such as are the products of fermentation; or that contain alcohol, ether, essential oils, &c.

It is a well established fact, that the contact of air is necessary to produce fermentation in a liquor, and that fermentation does not cease until a thorough decomposition has taken place in all the extractive matter, or, in other words, not until the liquor is entirely spoiled. To prevent this fermentation from proceeding too rapidly, wines and beers are put into *close* vessels as soon as that peculiar fermentation which produces the alcohol is considered complete. Wooden casks answer the purpose for a time, but to preserve the liquor for a longer period, glass bottles are resorted to, as being less porous than wood.

It appears therefore a highly probable circumstance, that if fermented liquors, and all such whose most essential properties are of a volatile nature, were kept in cylindrical vessels, with a floating piston to defend the upper surface from the contact of air, they might be kept for a long time without deterioration. How often does it happen that in drawing off a cask of malt liquor for daily use the earlier portions are spirituous and refreshing, while the later are sour or vapid? Would not the floating piston prevent these disagreeable results, and form a valuable piece of economy? The experiment might be made even with a pewter quart of porter, by having a piston previously made by the pewterer to fit it. We suspect the public will become much indebted to Mr. Evans for the useful nature of his inventions.

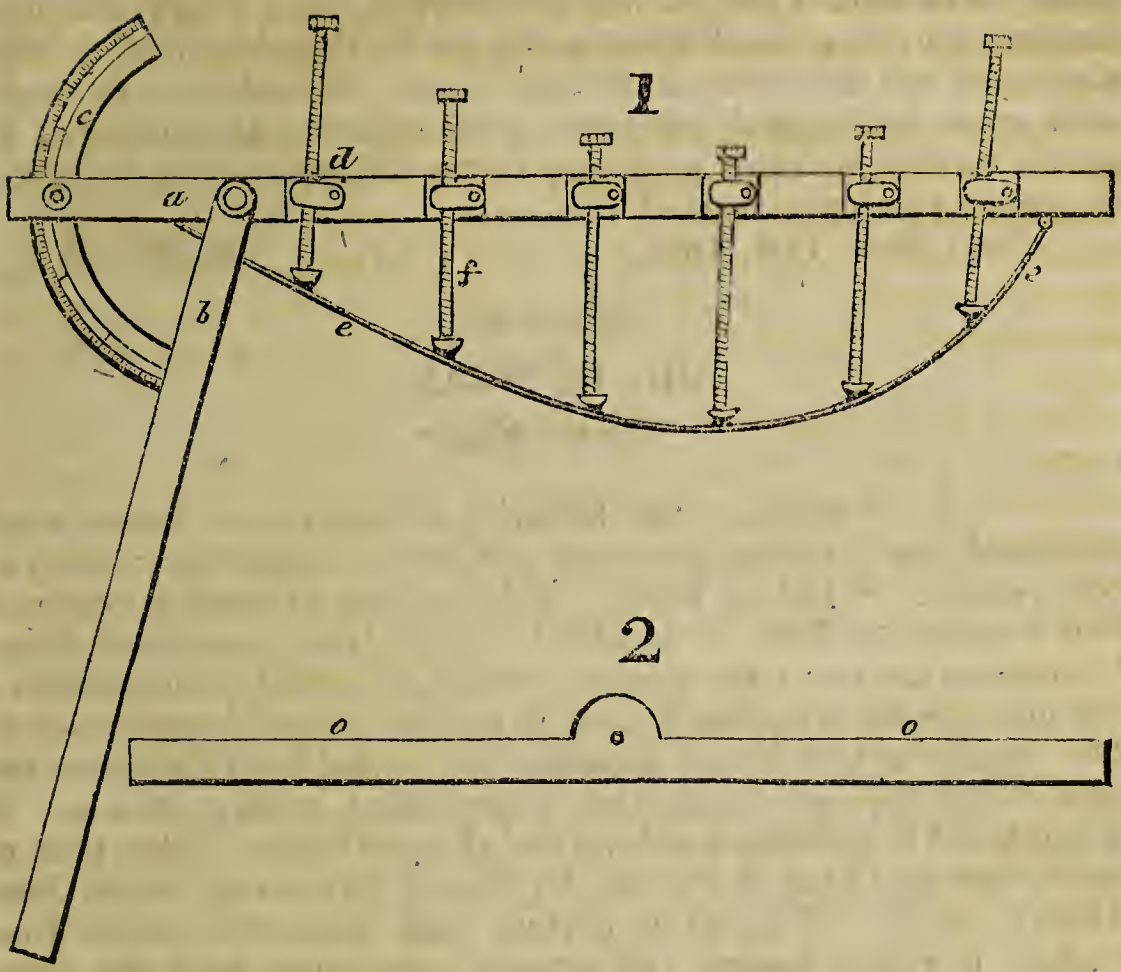
NEW MATHEMATICAL INSTRUMENTS.

"To the Editor.

"SIR,

"I AM a subscriber to your useful work, and being at present resident in the French metropolis, I propose sending you occasionally an account of some of the inventions of this ingenious people, when they happen to fall in my way, and I have leisure for that purpose.

"The subject of my present communication is to describe an instrument which will be found of great usefulness to all *artistes* on your side of the channel. It is called the Universal Bevel, of M. Alard. Its construction will perhaps be made intelligible by the annexed description with reference to the following sketch.



a and *b* (*Fig.* 1.) are two rules, connected together by a circular joint, *c* is an arch of brass, fixed to *b*, and sliding through a mortice or slit in *a*, to which it is affixed at pleasure, at any required angle, by means of the screw in *a* pressing upon it. The rule *a* has six or more square mortices made through it (in the drawing they are exhibited in section), in which are placed as many nuts, moving on pivots; each of these nuts is tapped to receive a long screw (as at *f*) working within them; and each of the long screws is fixed at one end to a thin flexible steel blade *e e* by means of a kind of swivel joint, which admits of the screw turning round in it without advancing, and allows it to press either direct or aslant. Consequently when the opposite ends of the screws are turned by the thumb and forefinger, the steel blade is pressed out, so as to adapt itself exactly to any given curve; and being thereby fixed in the same position, the curved line can be transferred therefrom to any kind of work, or on to paper.

"*Fig.* 2. is a little contrivance that I have adopted for some time past to draw the radii of wheels, as I find I can by means of it draw them in a quarter of the time which is taken up in using the common rule, as there is no occasion to be constantly adjusting it to the centre of the circle.

"I first made this for a temporary use, by cutting out an instrument of the shape from a piece of fine card-board, when finding it is so convenient for the purpose, I afterwards made one of a slip of thin sheet-brass, which I now always use, finding the convenience so

great. The central hole, it will be observed, is on a right line with the lines *o o*; if a small fine drawing pin be therefore fixed in that place, and into the centre of the circle struck, the radii may be drawn with great facility and exactness along either of the lines *o o*, by merely turning it at the periphery to the different points or degrees thereupon previously marked.

"*Paris, Sept. 15th,* 1825. "W. W.—N."

OIL OF TEAK.

"*To the Editor.*

"Sir,

"Perhaps the following extract from a French work published nearly twenty years ago will prove interesting to many of your readers. "Oil of Wood. This resinous oil which is extracted from a species of Teak, a beautiful kind of tree, a native of Pegu, by burning the tree; the woody parts are consumed, which causes a resinous varnish to run freely from all parts of the trunk and branches. This varnish is of a strong aromatic odour, but not injurious to the animal economy; nor productive of head aches, as turpentine is. It is employed in painting wood work of all descriptions, either pure or mixed with any kind of cement, for this oil takes every colour from white to black. The oil is drying, and preserves wood from cracks; it repels insects and vermin, preserving wood for many years *from being worm eaten*, as well as from the attacks of different kinds of marine animals. In proof of this, the vessels built at Surat, and Pegu, (which are always carefully coated with this resinous oil, both within and without,) last, it is said *three centuries*. A ship taken in 1762 by Comtè d'Estaing, in the Persian Gulph, was in good condition, *although it had been off the stocks* 170 years! To preserve artillery, the Europeans coat it first with the juice of aloes, and then with the oil of wood. Now I should like to know through the medium of some of your nautical correspondents, whether teak built ships, are ever subject to the dry rot? If they are not, is not the above oil the preserving principle, and would it not if used tend to prevent and preserve our navy from it?

"I am, Mr. Editor.

"Your Obedient Servant,

"J. S."

TO CONVERT BARS OF IRON PARTIALLY INTO STEEL.

The process of manufacturing of steel by cementation, consists in stratifying iron bars with powdered charcoal, and thus exposing them to a considerable degree of heat, excluded from asmospheric air; by which means a portion of carbon enters into chemical combination with the iron, constituting what is termed steel. This process, being somewhat tedious and expensive, causes steel to be double, treble, and even quadruple the value of iron; it therefore

becomes a great point of economy with a smith, not to use more steel than necessary. It nevertheless frequently happens that a much larger portion is used than is required, owing to the difficulty or labour in welding, or otherwise connecting the two materials together; and thus a bar of *all* steel is used, when one half of iron and half of steel would answer fully for the purpose intended. As a remedy for this inconvenience, a process has been lately adopted for converting bars of iron *partially* into steel. Supposing for instance, that it is required to convert one side of common flat bars of iron into steel, and half way through, the mode adopted is as follows: first make a layer or stratum of charcoal, on this make a layer of bars of iron, then a layer of clay (of difficult fusibility) of a proper thickness and well levelled; on the clay make another layer of bars of iron, then another of charcoal, and so on, in alternate strata, until the vessel (or cementing pot, as it is termed) be filled. Heat being then applied in the ordinary way, these bars are converted into steel half way through, the other half remaining iron.

If it be required to convert a greater or lesser portion of the iron into steel, the duration of the application of the heat is to be in proportion. If only the edges of the bars, or the surface of them is to be steel, then the heat would of course be continued for a short time; the period which the process occupies being from one day to a month, according to the thickness of the bars, or larger masses, that are to be so converted. It matters not the shape or the size of the iron, any part of which may be converted into steel by exposing such part to the usual heat, in contact with the charcoal; and separating the part to be left iron from the contact of the charcoal, by covering it with clay, or other substance, in which carbon is not present in quantity.

MISCELLANEOUS INVENTIONS,

Discoveries, & Processes in the Useful Arts.

Imitation of Gold.—M. Deittmer has published in the Hanoverian Magazine, the following of a compound metal, invented by Professor Hermstadt.

Take of pure platina	16 parts
pure copper	7 parts
pure zinc	1 part

Put them in a crucible, and cover them with powdered charcoal, and keep them over the fire until they are entirely melted into one mass. This compound is stated to be not only the same colour as gold, but likewise equal to it in density (specific gravity) and also in ductility.

Imitation of Platina.—Melt together one pound of brass with ten ounces of zinc. But as brass is composed of copper and zinc in

the proportion of about three pounds of the former to one pound of the latter, equal parts of copper and zinc will produce the same compound in imitation of Platina.

ARITHMOMETER.—We have received the following from a correspondent. I am desirous to have a correct idea of the arithmometer, a machine for which a French artist has lately obtained a patent. I understand that the most complicated calculations are done as readily and exactly as the most simple; and sums in multiplication and division of seven or eight figures, require no more time than those of two or three. A description of this singular instrument will greatly gratify your other readers. I am, ARITHMOS."

[As we have no knowledge whatever, ourselves, of the construction of this highly interesting machine, we shall be greatly obliged if any of our readers would favour us with a description of it.] ED.

LIST OF NEW PATENTS.

BRICK-MAKING.—To G. H. Lyne, & T. Stainford of Great Guildford Street, Southwark, for certain improvements in machinery for making bricks. 23rd. Aug. Six months.

NAVIGATION.—To Wm. Parr, of Union Place, City Road, for improvements in the mode of propelling vessels. 27th. Aug. Six months.

HAT-MAKING.—To John Bowler, of Nelson Square, Blackfriars Road, and Thomas Gaton, of the Strand, for improvements in the manufacture of hats. 27th. Aug. Six months.

NAVIGATION.—To Charles Mercy, of Stoke Newington, Middlesex, for improvements in the propelling of vessels. 8th. Sept. Two Months.

MACHINE "FOR IMPELLING POWER."—To Wm. Jefferies, of 46, London Street, Radcliffe Cross, for a machine "for impelling power, without the aid of fire, water, or air." Sept. 15. Six months.

STEAM ENGINES.—To Jean Antoine Tessier, of Tottenham Court Road, for improvements in steam engines. Sept. 15. Six Months.

TO OUR READERS AND CORRESPONDENTS.

We can assure J. C. that we are always happy in obliging our correspondents, but a description of the invention he mentions would in its present state be premature, some important improvements have been recently suggested, and the experiments nesessary to be made before going to so large an expence unavoidably causes much delay.

Artificial warmth and ventilation. The papers, &c. on this subject kindly sent to us, will receive our earliest attention:—we have hitherto been prevented from availing ourselves of the valuable information they contain.

We thank J. W—e for his communication, but it is unsuited to the nature of our work. His sentiments do him honour, and we strongly recommend his publishing the paper, in one of the Monthly Literary Journals, in which neither the subject, nor its length, will be an obstacle to its insertion.

H. L.—Vulcan, and Throttle Valve, if possible, in our next.

Communications received from P. P.—a Subscriber—and J. Manby.—

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Fig.1

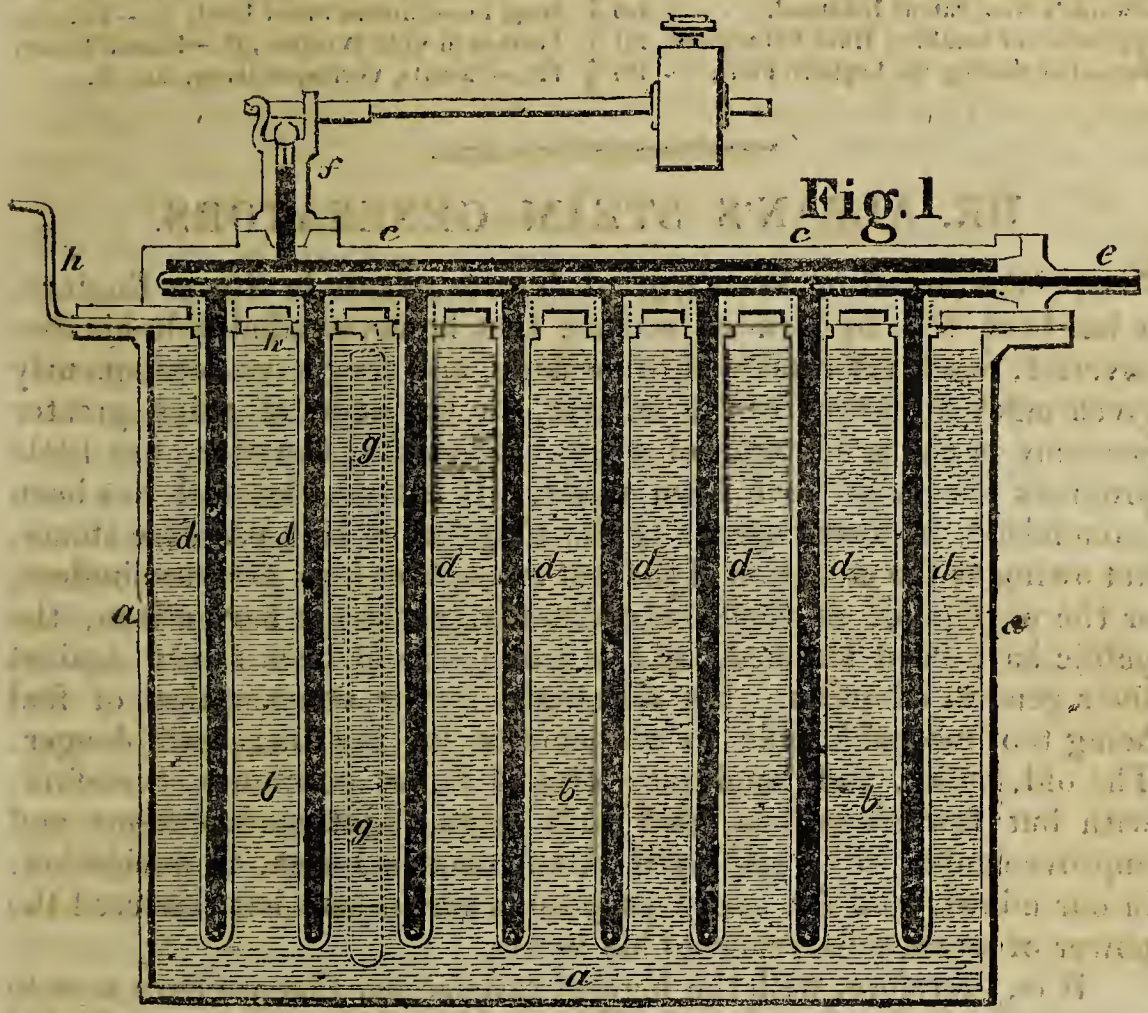


Fig.2

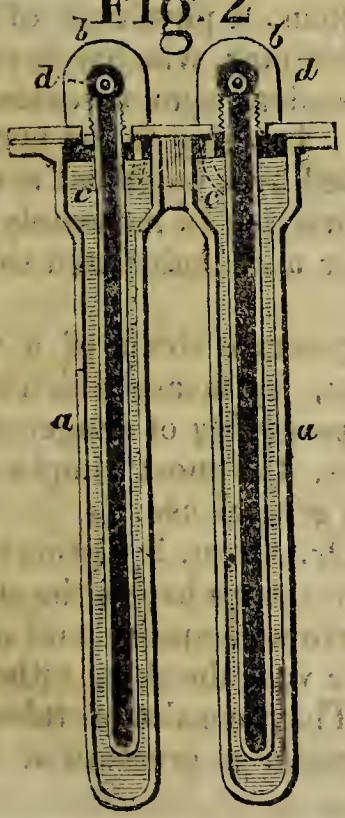
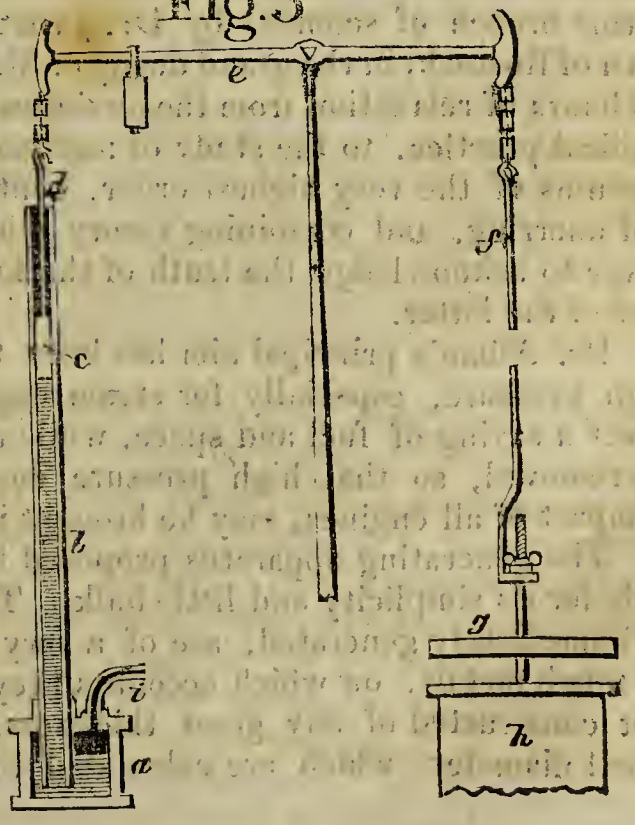


Fig.3



DR. ALBAN'S STEAM GENERATORS.

CONTENTS.

Dr. Alban's Steam Generators, - - - 113
Patent Endless Lever Action, - - 118
Design for a Stove, - - - - - - ib.
New Cat Block, - - - - - - 119
Edwards's New Patent Inkstand, - - 120
Apparatus for breaking Hard Substances, 121
Method of making the Leghorn Plait, - 124
Beacham's Patent Water Closet, - - 125
To prevent Sea Sickness, - - - - - 126
Miscellaneous :—Bycarburet of Hydrogen, 127,—An easy method of making Transparent Soap, ib.—Chinese Sheet Lead, ib.—Tanning Leather in Cold Weather, ib.—Roman Roads, 128,—Patents, Correspondence, &c. ib.

DR. ALBAN'S STEAM GENERATORS.

Since the period of Watt's great improvements in Steam Engines, it has been felt by men of science that however admirable his discoveries, much yet remained to be done, and they have consequently given much attention to the subject, in the hope of using greater economy in the production of steam. Hitherto, however, but little progress seems to have been made. It is true, that fuel has been economised, in some degree, by the adoption of high pressure steam, but owing to the incaution of the first erecters of high pressure boilers, or the negligence of their subordinates, accidents have arisen, the public have been alarmed, and objections have been raised against their general adoption; the difference in the consumption of fuel being too inconsiderable to compensate for the increased danger. The old, bulky, and ponderous form of boiler continues, therefore, with but few exceptions, and with some slight modifications and improvements, to be employed in our manufactories, in navigation, in our mines, and for every purpose wherein man has rendered the power of steam subservient to his wants.

It is, therefore, with the highest satisfaction that we have now to communicate to our readers the discoveries and improvements effected in this branch of science, by Dr. Ernst Alban, a physician of the town of Rostock, in the grand duchy of Mecklenburg, who has devoted his hours of relaxation from the anxieties attendant upon an extended medical practice, to the study of mechanics; bringing to the pursuit a genius of the very highest order, controlled by a judgment severe and unerring, and combining theory with practice so intimately, as never to acknowledge the truth of the former until submitted to the test of the latter.

Dr. Alban's principal aim has been to generate steam of a very high pressure, especially for steam engines, by means which shall effect a saving of fuel and space, while *all possibility* of danger shall be removed, so that high pressure engines, the most simple and compact of all engines, may be brought into general use.

The generating apparatus proposed by Dr. Alban, is distinguishable for its simplicity and little bulk. The vessels wherein the steam is immediately generated, are of a very narrow compass, and made of tough metals, on which accounts they are very durable, although not constructed of any great thickness. They consist of tubes of small diameter, which are calculated to sustain a pressure of 4 to

6000 lbs. to the square inch, thus removing all chance or possibility of their bursting, an event which, even if it could happen, this construction would render perfectly harmless. These generating vessels have only about one foot of steam producing surface to the horse power, and in order that the generation of steam may be increased to such a degree, that the intended effect can be produced, and in order at the same time to withdraw them from the destroying influence of the fire, they are placed within a medium, consisting of an easily fusible metal, or metallic mixture, such as tin and lead, which is introduced into a tank or vessel of cast iron, and exposed therein to the action of the fire. In these latter, which Dr. Alban calls his metal vessels, he opposes a very extended surface to the action of the fire, without infringing on space, or requiring any great quantity of the fusible metals for filling them, as may be easily seen by reference to the form of the metal vessel, *fig.* 2. By this means caloric is conducted in large portions to the medium, which being a good conductor of heat rapidly imbibes it, and forms, as it were, around the generator, a store of caloric, which it gives out so equably and rapidly, that the tubes, with but a small generating surface, collect and give out to the water which is to be converted into steam, as much caloric as if that surface had been ten times the size upon the ordinary construction. Both the metal vessels and the generator present an inconsiderable surface to the atmosphere, and in this manner the inventor has sought to prevent any condensation in the generator of the steam already generated, as well as to prevent, generally, any disadvantage resulting from the radiation of caloric.

The water is conveyed into Dr. Alban's generator, only in the quantity required to produce a given and continuing effect. For this purpose the forcing pump, by means of which the injections are supplied, is made to regulate itself in such a manner that it either moderates or entirely suspends the injection of water, according to the state of pressure in the generator. The steam generation is thus entirely independent of the management of the fire by the stoker, and is at all times subservient to the wants of the engine to which this apparatus may be applied. All possible danger would likewise be removed by this means, even in the absence of any safety valve. When it is required to stop the engine, it is only necessary to put the forcing pump out of action, and the generation of steam ceases of necessity.

In order to prevent the metallic fusion from being overheated, in cases where a smaller supply of steam is required, or where a suspension of steam generation takes place, by the stoppage of the engine, or otherwise, the Inventor has arranged a heat regulator, which regulates the intensity of the fire. This apparatus indicates the degree of temperature of the fusion, upon which solely its action depends, and the generation of steam in the generator has no influence whatever upon it; the regulator continuing to act when the generation of steam has ceased, on which account it is essentially different from any heat regulator hitherto used. Its application is indispensable to this apparatus, in order to prevent so great a

heating of the generating tubes as might occasion a decomposition of the water injected therein.

The very great saving of fuel occasioned by this invention, is accounted for, partly in consequence of the steam being produced at so very high a pressure, and partly by the circumstance, that the metallic medium, when in a state of fusion, is one of the best conductors of heat in nature, receiving and collecting the heat within itself very quickly, and without loss, and thereafter giving it out in a concentrated form to the generator. Owing to the constant motion kept up among the hotter and colder parts of the metallic fusion, as in the case of heated water, the more heated portion having a tendency to ascend, while the cooler part descends, the caloric is distributed very quickly and equably through the whole body. All congealment of the metallic medium is avoided, by using such an admixture of metals, as will fuse at a temperature lower than that which the steam receives within the generator. In ordinary boilers, the heat of the fire acts upon a bad conductor of heat, water, and upon a proportionable large body thereof, the parting with its heat cannot, therefore, be free or quick, and in order to produce any powerful effects, it is necessary to oppose a very large surface of the boiler to the action of the fire.

For the reasons stated, it is, however, quite otherwise with this new apparatus for generating steam, and the surface opposed to the action of the fire is therefore considerably less, in proportion to the generation, than in ordinary boilers. The rapid generation of steam, by this method, is likewise much favoured by the circumstance, that water is injected in small quantities only, and is distributed on all the sides of the generator.

Figures 1, 2, and 3, are representations of the generating apparatus, constructed in London, under the superintendance of the inventor. It has a double metal vessel, and two generators; *fig.* 1, is a longitudinal section thereof, *a a a*, is the cast iron metal vessel. *b b b*, the metallic mixture. Supported upon the lid or cover of the metal vessel, is the strong top of the generator *c c*, containing a cylindrical chamber of two inches diameter; *d d d d*, are the wrought iron generating tubes, suspended in the metallic fusion; they are of $1\frac{1}{8}$ inch bore, and are screwed into the top *c c*, so that they may be taken out whenever they require cleaning. *e*, is the injection pipe, made of copper, through which the water is conducted into the generating tubes, over each of which a small hole is perforated. *f*, is the steam pipe, connected with the engine and the safety valve.

Fig. 2 is a transverse section of the double metal vessel; it is freely suspended in the furnace, and exposed on all its four sides and its ends, to the action of the fire, so that although it is but 4 feet long, $3\frac{1}{2}$ feet high, and, including the space between each vessel, takes up only 9 inches in width, it exposes to the fire a surface of sixty square feet. *a a*, is the double metal vessel; *b b*, the two generators; *c c*, the two injection tubes, which are joined together externally, and communicate in one pipe to the forcing pump. This pump is of the usual construction, furnished with a lever and weight,

which are raised by the engine, through any of the known means. If the production of steam in the generator be too great for the wants of the engine, the pressure in the steam chamber will act against the injection, and the weight will be insufficient to force down the piston of the pump, which will thus remain inactive, until the pressure is diminished, by the ceasing of production and the expenditure of the engine.

The heat regulator consists of two pipes filled with atmospheric air, one of each being inserted into each metal vessel, *fig.* 1, *g*, and surrounded by the metallic medium; to both pipes, very narrow tubes are fixed, *fig.* 1, *h*, and *fig.* 3, *i*, which are joined together externally into one tube, which opens inside the mercurial cistern, *fig.* 3, *a*; within the mercury therein contained, is immersed a vertical tube *b* with a float *c* swimming on the top of the mercury. This float is connected, by means of the rod *d*, with the lever *e*, and acts by the rod *f*, upon the damper *g*, which regulates the draught of the fire in the ash-hole. When the air in the pipes *fig.* 1, *g g*, becomes heated by the fusion, it expands progressively as this becomes hotter, presses on the mercury in *a*, *fig.* 3, and causes it to ascend in the tube *b*. By the rising of the mercury, the float *c* is made to ascend likewise, and acts by the rod *d* on the lever *e*, and thereby on the damper *g*, so that should the temperature of the fusion be greater than is required, it gradually closes the air hole *h*; the supply of air to the fire is thus prevented, and the heat is consequently diminished.

Dr. Alban has produced by means of his apparatus, steam of a most extraordinary pressure, and in great volumes, the effects of which have filled with astonishment, both the scientific and uninitiated. The precision wherewith the generation is regulated, and the total absence of all danger resulting from it, are circumstances which render this apparatus very interesting and valuable. As the generators cannot be destroyed, and the metal vessels alone will require to be renewed, the maintenance of the apparatus is attended with but a trifling expense. It must be apparent, that by the first-named circumstance the danger is rendered nugatory; for a generator once proved will last for ever, an object which has never before been attained in any apparatus for generating steam. The thinness of the generating tubes is conducive to their durability, as the expansion by heat is more equable in their sides than it would be in strong vessels. The inventor has learned from experience that thick-made boilers will burst more readily than thin ones. The communication of heat to the water is likewise much more powerful in them than in thick-made boilers.

An apparatus of the foregoing description, calculated for an engine of ten-horse power, now constructing on an entirely new principle by Dr. Alban is, inclusive of the furnace, only 6 feet in length, 5 feet in height, and 3 feet wide. It consumes only 6 to 8 bushels of coals per day, and the metallic mixture is fused in less than an hour, with half a bushel of coals.

We hope shortly to be able to gratify our readers, by inserting a description of Dr. Alban's *Steam Engine*, of which the highest

opinions have been formed by men of science, as regards the simplicity of its construction, its little liability to require repairs, and the facility with which these can be supplied when requisite;—its smallness of bulk when compared with its power;—the avoiding of waste in the application of steam,—and the little friction between its parts which it has to overcome.

The rare combination of talents exhibited by Dr. Alban in these important inventions, induces a hope that the world may be still further benefitted by his discoveries; and we have heard with pleasure that the Doctor is engaged in perfecting other inventions which will be of the first importance in manufactures, and which will place his name amongst those most honoured for their mechanical and scientific attainments in any age or country.

THE NEW PATENT ENDLESS LEVER ACTION.

"*To the Editor.*

"SIR,

"IN No. 54 of your Register, you have detailed the specification of Mr. Burnett's patent for a *New rotary or endless Lever Action* (being an improved system of Gearing invented by his friend Mr. Harrison G. Dyer, of Boston, in America), and have spoken favourably of it; and it has also been eulogized by Dr. Birkbeck at the Mechanics' Institution; it will therefore be both to you and to that gentleman matter of surprize when I inform you, that the very same thing was invented, and a treatise published, detailing in a most able manner its properties and modes of application, by Mr. T. Sheldrake, of No. 50, Strand, more than 14 years ago. The date of the volume which lies before me is 1811, and the publishers are Messrs. Egerton, Charing Cross; Taylor, Architectural Library, Holborn; and Asperne, Cornhill; at either of which places Mr Burnett, or his friend Mr. Harrison G. Dyer, may obtain it. I have stated these facts at this time, because, if it should prove identified with Mr. Sheldrake's invention, an essential service will be performed to the other party, and should the plan proposed prove advantageous, the merit of priority may rest in the right place.

"I remain, Sir,

"*22, Grange Walk,* "Your most obedient Servant,

"*Bermondsey.* "W. J. CURTIS."

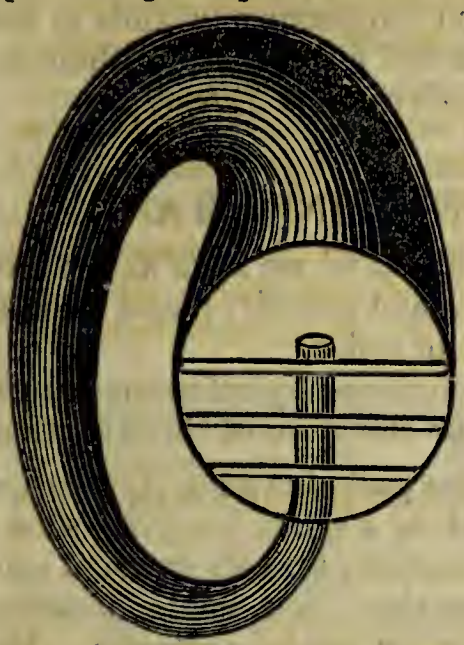
DESIGN FOR A STOVE.

"*To the Editor.*

"SIR,

"I NOTICED in a recent number of your valuable work some useful observations and rules on the constructions of chimnies. Now I am half inclined to believe that chimnies (in the common acceptation of the term) may be entirely done without, and the

emission of smoke in apartments containing coal fires, be at the same time prevented, by the employment of a stove, constructed upon the principle of that represented by the annexed diagram.



"The fire part is of course included in the space behind the bars; immediately above this a wide mouthed tube of the whole breadth of the fire, opens, and receives the smoke and rarified air, which then passes along the contracted curved pipe and enters the fire at the bottom. This latter end of the pipe is supposed to be in the centre of the fire, and consequently red hot. With matters thus circumstanced the effects that would possibly result are the following. The smoke would be consumed;—the air would be continually rarifying, producing a partial or imperfect vacuum, and in consequence an increasing current or draft; a more vivid and perfect combustion of the fuel; and as the heated air could not escape, the caloric would be given out into the room. Mind, Mr. Editor, I do not assert these things, I only suppose them *possible*, as *I* can see no reason to the contrary, and should be really glad to have my eyes opened by the superior wisdom of some of your correspondents on the subject. *If*, (though a word of only two letters, is really a very great one, for more depends upon it than upon any thing else, for if) the fire will burn when so circumstanced and consume the smoke, the invention is *invaluable*, but if it will not, then it is like myself, *good for nothing*,

"Being, unfortunately,
"NO PHILOSOPHER."

NEW CAT BLOCK.

On the 2nd of September a newly-invented cat-block, intended for the Driad frigate, fitting at this port, was tried on board his Majesty's ship Britannia, to prove its strength before sending to sea, and the result being perfectly satisfactory, it has been delivered over for sea-service in order to ascertain the merits of the invention. This improved block, we understand, is the invention of Mr. Bothway, gunner of his Majesty's ship Belleisle, &c.

It has been got up in the dock-yard here by order of the Honourable Commissioners of the Navy Board, under the superintendance of the inventor, and should it be found to answer, of which there can be little doubt, its general adoption will be a great convenience to the service. The chief merits of the invention consist in the decreased weight of this hitherto cumbersome article (the present block only weighing about two thirds of that usually employed) and in the very great facility with which it may be locked to the anchor in consequence of the alterations in its construction.

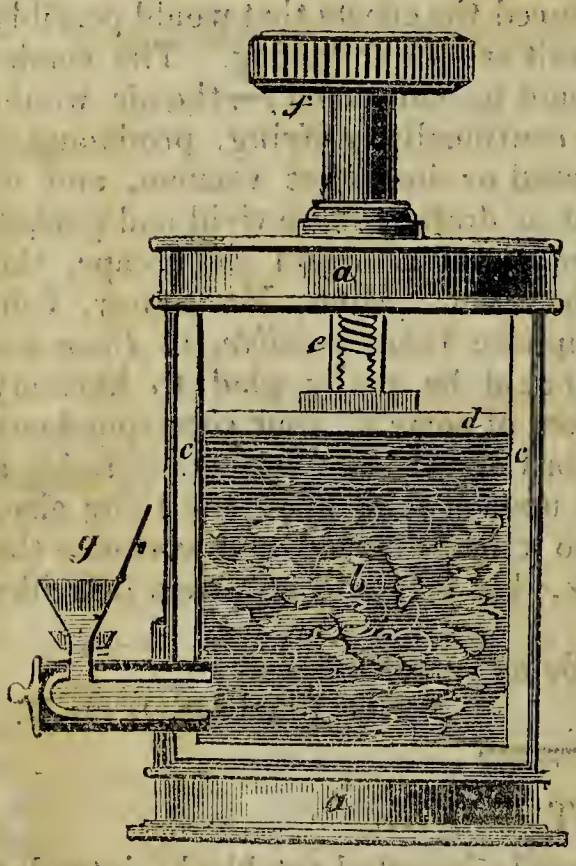
It is rather remarkable that there had hitherto been no improvement in the form of this machine within the oldest memory.

We may remind our readers that Mr. Bothway is also the inventor of the excellent machines for raising and supporting invalids in bed now introduced into the public hospitals and medical establishments, with the high approval of the faculty.—*Devonport Telegraph.*

EDWARDS'S* NEW PATENT INK-STAND.

This is the best contrivance of an Ink-stand we have as yet seen on account of its superior convenience, and stability; and from its extreme simplicity, not liable to get out of order.

The construction will be readily understood by referrence to the annexed figure, which gives a side view or elevation of the invention,



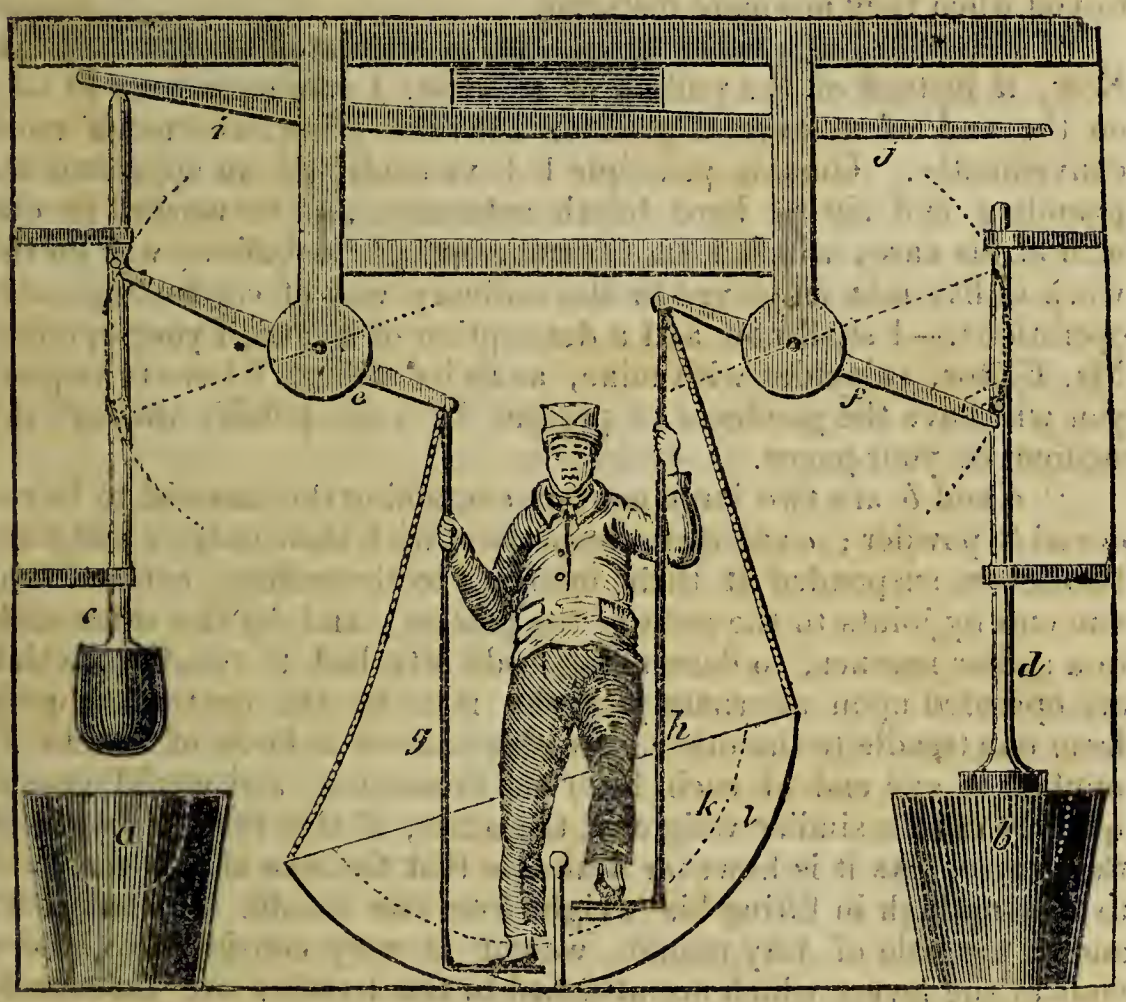
those parts between the top and bottom *a a* are however shewn in section, that its internal construction, and mode of action may be made apparent. The external casing is of metal, bronzed, and elegantly wrought. The internal is a cylindrical glass cup *c c*, of considerable thickness, the upper part of which is closed by a glass piston *d* accurately fitting the cylinder, so as to allow of its being easily moved up and down. In this casing of glass is placed a quantity of loose horse-hair and wool, which imbibes and retains the ink, free from contact with the metal, that would otherwise become corroded. On the upper surface of the glass piston a hollow screw *e* with a disk of metal at the end is made to operate by pressure downwards, when the top piece *f* is turned by the finger and thumb; the latter turns the solid screw, and causes the hollow screw to advance or recede with a sliding motion, so as to press uniformly upon the piston without the friction of turning against its surface.

At the lower part of the ink reservoir an aperture is made, into which a tube is fixed that conducts the ink to the little cup *g*, when the wool is compressed by a turn of the screw pressing down the piston. The little cup previously empty is thus instantly supplied with fresh ink with no more trouble than taking up a pen, and should a little more ink be forced into the cup than is necessary by carelessly turning the screw too far, it runs over and is caught in the

* Mr. Edwards, of the corner of King Street, Bloomsbury Square.

little saucer shown below. When the inkstand is not in requisition a half turn of the screw the reverse way, causes the ink to flow back again; as the wool being thereby relieved of the pressure, re-absorbs the fluid.

The ink being thus returned into the reservoir, none can be spilled, even if upset; it is preserved from the contact of the air, consequently from drying up, as well from dust; and it may be instantaneously brought into use whenever required. These are advantages which will be appreciated by every body, but more especially by persons travelling, or in the army and navy.



APPARATUS FOR BREAKING HARD BRITTLE SUBSTANCES,

AND REDUCING THEM TO POWDER, WITH GREAT EFFECT AND LITTLE LABOUR.

"To the Editor.

"SIR,

"IT has often appeared to me that the *mode* of applying human labour as the first mover of machines is frequently very injudicious; I allude in particular to mills and cranes, and such as have a rotatory motion given to them by manual power at the winch. The force applied in this manner by a man of ordinary strength is calculated, I believe, at only 30 pounds, which is owing to the

unfavourable position for exerting the muscular power.* Now whilst a man is thus labouring hard to produce an effect of 30, he is pressing the ground upon which he stands with a weight upon the average of 150. Then as it is clear that this pressure or force may be given almost *without labour*, why not so apply it. I am aware that cranes were formerly constructed, with large wheels, in which men were employed to walk in the interior on the periphery, but owing to the bungling manner in which the adaptations were managed, very little effects were produced, and very dreadful accidents occurred; and they were abandoned. Considering, however, the principle to be surpassingly excellent, I have sketched, in the rough, several modifications founded upon it, which I will take the liberty of sending to you when they are more matured.

"The power of a horse in drawing is calculated at about 150lbs. Now, if instead of the pulling of a horse, I employ a man to step on the end of a lever, I produce the same effect, and much more conveniently. On this principle I have contrived an apparatus for pounding and sifting hard brittle substances, to be worked by one man at his ease, which I am sanguine enough to believe will do the work of five men employed in the ordinary way of conducting those operations.—I shall now add a description of it, and if your opinion, Mr. Editor, coincides with mine, as to its utility, I have to request you will have the goodness to present it to the public, through the medium of your pages.

"*a* and *b* are two large mortars containing the material to be reduced to powder; *c* and *d* are the pestles, with their rods; *e* and *f* are two levers suspended at their fulcrums to the ceiling, connected at one end by joints to the ends of the pestles; and by the other end, in a smilar manner, to descending rods attached to treadles, which are operated upon alternately by the man in the centre stepping from one treadle to the other. In this manner a force of 150lbs. is applied to one end of each lever in succession, and would consequently raise a similar weight at the other, if the fulcrums were in the centre. As it is however desirable that the man should not have to step up high in lifting his weight from one treadle to the other, and as a pestle of fifty pounds weight is very considerable, those ends of the levers which are attached to the treadles are shortened, so as to make the force about 120. This loss of power in the first instance, is however fully compensated for, by the pestles being raised higher in the same space of time, or with greater velocity, and the increased momentum with which they (alternately) strike the springs, *i j*, in the ceiling, is returned by the re-action of the latter, upon the substances in the mortars.

"When one of the pestles has struck, the man steps off that treadle which operates upon it, on to the other; the long arm of the lever of the former then descends by its superior weight, and

* This is supposing a cord attached to the handle of the winch were carried over a pulley, and the other end tied to a weight of 30 pounds; it would then require the ordinary exertion of a man to raise it by turning round the winch. Ed.

being jointed near the extremity, it passes by the pin on the rod (which should have an anti-friction roller upon it) by the joint opening, (as shewn in dotted lines) and afterwards closing, it locks itself under the pin. In its re-ascent it then takes up the rod and pestle, and allows them to drop when it has passed from the sphere of its action, as shewn on the opposite side, where the lever is exhibited as being just beyond the point of contact, and the pestle is about to return to the mortar with all its accumulated force. I am not at present enabled to calculate that force from any very precise data.*

"Underneath each treadle a strong steel spring is fixed, to prevent those shocks which the man might experience by the treadles striking against the floor, after the levers have passed the rollers on the pestle rods; and the reaction of these springs is attended with the further advantage of assisting the man on to the other treadle.

"It has been shewn that by this method of pounding, a surplus of power amounting to about 70lbs. is devoted to the giving an accelerated force to the pestles. If we then take away 2 or 3lbs. of this surplus power for the purpose of sifting, it may so well be spared, as to make a scarcely perceptible difference in the impelling force of the pestles. There are several obvious modes of causing sieves to vibrate by this apparatus, and I have endeavoured to make choice of the most convenient situation. Accordingly I place a large semicircular sieve on the ground, and attach cords to each extremity or corner, which being made fast to the ends of the levers causes it to rock, as they are alternately raised or depressed. In the drawing the sieve is shewn as moving upon a central bearing or pivot, this is however only another mode of producing the effect, and in my opinion inferior to the rocking motion. The sieve is composed of two parts, viz. *k*, which contains the material to be sifted, and *l* the receptacle for the resulting product, or powder. The situation of this sieve between the two mortars for receiving their contents alternately would be found convenient. It should be placed at a convenient distance behind or before the man at work; a rod should therefore be fixed to the end of each lever at right angles with them, but in an horizontal position, which it would always maintain; and a long range of sieves, separate or connected, may be moved by the same means, according to the length of the horizontal rod.

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* According to experiments made by Col. Beaufoy, F. R. S. a pound weight raised six inches high and dropped into the empty dish of a pair of scales raised 15 pounds placed in the opposite scale. If then a pestle of 50 pounds weight is simply let to fall by its own gravity one foot high the effect must be equal to at least 1000 pounds. If that weight be raised higher, and forced against a powerful spring, the reaction would produce such a momentum as to warrant the assertion of our correspondent. The effect is indeed still more than he appears to have contemplated, for the force operating on a smaller surface, it will be increased in proportion to the differences of the surfaces in contact. This mode of applying the force of momentum to the breaking or pounding of hard substances, seems therefore to be peculiarly advantageous. The bottoms of the pestles should be spherical, which would increase the effect, by lessening the point of contact.

"The principle and mode of action of this sieve is the same as those ordinarily used, I have therefore adopted it in the drawing, for fear of making too great an inroad at once upon the prejudices of those who may be unwilling to conduct the operations of pounding and sifting by any other, than the "good old-fashioned way;" but for my own credit sake, Mr. Editor, allow me to observe, that I think the *principle bad*, and that my improved drum-sieve, described in your 4th Number, is infinitely preferable, to which I must beg leave to refer those of your readers who are disposed to enter into the subject with the proper spirit of improvement. In that instrument the powder is thrown out at every interstice over the *whole circumference* of the cylinder, and *the fallen powder lies at rest*. By all other sieves not half the powder can be ejected, owing to the *inferior extent* of their sifting surfaces, the kind of motion is inferior for producing the effect, and the *fallen powder is constantly agitated* and thrown up against the bottoms of the sieves, stopping up the interstices, and impeding the operation. The labour is also much greater. The motion required in my drum sieve is, alternating therefore they may be adapted at once to my pounding apparatus by simply tying the handles to the vibrating rods or levers.

"In my drawing, and in the description, I have not attended to those little adaptations of the parts, which not only every engineer, but every carpenter and smith, knows well how to supply, and I have omitted mentioning them, to avoid unnecessary prolixity. In fine, I believe the principle to be good, and it will afford me as much pleasure as any of your readers to see the arrangements improved upon by other persons.

"In conclusion, permit me to add an observation which strikes me as very important, it is this:—if the pestles and mortars were made of iron, (the latter perforated deeper) the apparatus would apparently answer extremely well for breaking stones for Mac Adamising the public roads.

"Your constant Reader and Wellwisher,

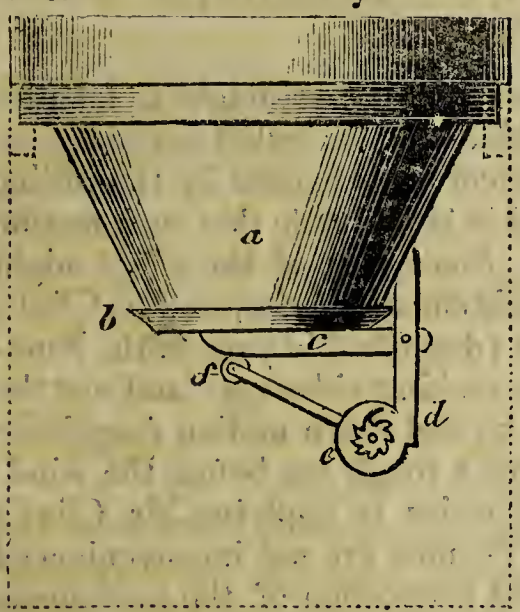
"L. H."

Method of making the Leghorn Plait.—The ears are cut off the straw, and the straws sized as to length and thickness, and also colour. Thirteen straws are then taken and tied together at one end; they are then divided into a right angle, placing six straws on the left side, and seven on the right. The seventh or outermost on the right, is to be turned down by the finger and thumb of the right hand, and brought up under two straws, over two and under two, and thus seven straws will be placed again on the right side of the angle; and so on alternately, doubling and plaiting the outermost seventh straw from side to side, until it becomes too short to cross over so as to double on the other side of the angle; then another straw is to be taken, and put under the short end, at the point of angle in the middle of the plait; and, by another straw coming under and over the joined one from both sides of the angle, in the operation

of plaitting it will become fastened; the short end being then left out underneath the plait, and the newly fastened straw taking its place on that side of the angle to which the short straw was directed, and thus the plaitting is continued, until a piece of about twenty yards long is completed. The short ends which are left out are then cut off with scissors.—*Scientific Gazette.*

BEACHAM'S PATENT WATER CLOSET.

Mr. John Beacham, Cabinet Maker, of the Strand, has lately introduced a very decided improvement in the construction of Water Closets, especially as applied to those of the portable kind. The construction is seen by the annexed diagram. *a* is the basin, *b* the



trap or valve at the bottom, *c* a piece of brass affixed to the bottom of the valve, acting as a lever for opening or shutting the same, its fulcrum being on a fixed axis in two upright brass stems one of which is shown at *d*. The latter are affixed to the metallic casing which incloses the basin, and thus forms a supporting frame-work for this part of the apparatus. The lower ends of the stems *d* form two circular checks *e*, for inclosing a convoluted spring of a cylindrical form, like the usual door spring; but instead of steel, it, is made of tough hammer-hardened brass, which possessed, when coiled up, considerable elasticity, and is not destroyed or injured like steel, by rapid corrosion. To the spring is attached a stem carrying an anti-friction roller, which presses against *c* with the requisite force to keep the valve *b* shut. This force may at any time be regulated in a minute, by means of a screw on the opposite side of the barrel or spring; if turned with a screw driver in one direction the force of the spring is increased, and if in the reverse direction, it is relaxed; and it is fixed to the required degree by the pull falling into the teeth of the ratchet wheel shown in the centre of *e*. The method of working the valve by the action of this spring is the essential and valuable part of the invention, and it is that on which the claim of patent right depends. The little roller, it will be observed, does not act upon an horrizontal plane surface, nor against an inclined plane, but it runs upon the curved or convex surface at the end of the piece *b*; the effect of which is, that when the trap or valve is opened by the weight of the contents of the basin, or by water from the pump, the force of the spring gently relaxes, instead of increasing, permitting it to open wide, and be thoroughly cleansed; and the valve as it returns, being operated upon by the increasing force of the spring, is thereby shut up very closely.

This mode of regulating the pressure is ingenious, and produces that uniformity and certainty of effect so much desired; without which indeed a machine of the kind is a nuisance instead of a convenience.

The dotted lines show the manner in which the apparatus is dropped into a pail. The double rim of the latter is made to contain a little water, forming a little canal all round, and the projecting rim of the former being immersed in it, an air tight joint is thus produced, which prevents the escape of effluvia. The pail, &c. is inclosed in mahogany or other cases, wrought so as to represent various articles of the furniture of a room, in the usual way.

TO PREVENT SEA-SICKNESS.

" To the Editor.

" Sir,—It has occurred to me that some contrivance might be adopted to prevent that malady, so dreadful while it lasts, called sea-sickness. It is quite evident that this singular affection is caused by the rolling motion of a vessel over the waves, and it is probable that such motion to the hull of a vessel is inevitable. Some part of the effect might be avoided by the employment of vessels constructed upon Mr. Clint's ingenious plan of balancing the masts (described in your 26th. Number) but they would only prevent the rocking *sideways,* and not the dipping as it is called, which is the up and down motion *lengthwise* that a vessel experiences in going over a rough sea before the wind. There would likewise be other difficulties in applying Mr. Clint's valuable invention to this purpose. Seamen are not inconvenienced by the rolling of a ship, and the great proportion of the passengers suffer but little, or soon recover themselves; my proposition must, therefore, be considered as only intended for passengers of infirm constitutions, or suffering under debility, to whom the exhaustion of a long sea-sickness might prove fatal. It is to have a crib so formed as to be able to float in a vessel of a little larger dimension and of a similar shape (something like two small boats one within the other) the interior one to be furnished with curtains and a tester. Between the two boats to place a sufficient quantity of quicksilver to keep them apart, when the interior one is loaded by the weight of the occupant. Those parts of the vessels to which the quicksilver comes in contact, should be as smooth as possible, and for that reason it would be desirable that they be made of some thin metal in sheets, such as tinned plates, iron, or copper. The exterior vessel, which is fixed to the deck, would consequently have all its motion, but the interior one, or crib, would constantly preserve its horizontal position. With the curtains of the crib open, the person lying in it would see the motion of the vessel, by the continually changing position of the several parts of the cabin, which would perhaps of itself create, at first, giddiness and sickness, but this would be entirely prevented by drawing the curtains so as to close the rest of the cabin from view; then no motion whatever would be either seen or felt. That this effect would take place, may be proved by a very simple experiment: get two

common crockery basins, place one within the other, with quicksilver between them, then holding the exterior basin in your hand, incline it in various ways the same as the rocking of a ship, and you will find the interior basin steadily preserved in its horizontal position. I shall conclude my letter here, as I only threw out the suggestion, as a hint for some of your ingenious correspondents to improve upon.

"As some objections may be started to the plan, on account of the expence of the quicksilver, it is proper, perhaps, that I should add, that that metal is an article of general commerce all over the world, and that it is almost of as ready a sale as bullion:

"Your constant Reader,
"L H."

MISCELLANEOUS INTELLIGENCE.

Bycarburet of Hydrogen.—An extraordinary liquid, specifically lighter than water, and colourless as that fluid, is produced in considerable quantities at the Portable Gas-works, in London, at the bottom of the vessels in which the gas is compressed, for filling the lamps. It has been analized by Mr. Faraday, who separated from it a bycarburet of hydrogen, composed of two atoms of carbon, with three of hydrogen. Between the temperatures of 42° and 86° Fah. it preserves the liquid form. Below 42° it assumes the solid state, forming dentical transparent crystals; at 0° it has nearly the whiteness and hardness of loaf sugar.

An easy Method of making Transparent Soap.—Cut some Windsor soap, or other soap made from tallow, into small pieces, put them into a gallipot or glass phial, pour sufficient alcohol over the same just to cover, and expose the moisture beside a fire to a moderate heat until it be dissolved. The vessel should be slightly covered to prevent the escape of the alcohol before the solution is complete, and this might be done either by a piece of thin paper tied over the mouth, or a cork loosely inserted into the neck of the phial. When thoroughly melted, pour it out in the fluid state into a mould, in which it will harden as it cools. In order to colour this soap, mineral colours are preferable to vegetable, the latter being changed by the alkali.

Chinese Sheet Lead.—The extremely thin sheets of lead with which tea chests are lined are made in China by the following simple process. A man sits upon a floor with a large flat stone before him, and another moveable one at his side on a stand. His fellow-workmen stand beside him with a vessel full of melted lead, and having poured out a certain quantity on the large flat stone upon the floor the other immediately lifts the moveable stone, and dashing it on the fluid lead presses it out into a flat and very thin plate. The stone and lead are then quickly removed and the operation renewed, which is repeated in quick succession. The rough edges are afterwards cut off, and the sheets soldered together for use.

Tanning Leather in cold Weather, may be effected without much difficulty or extra trouble. It is merely to boil a quantity of

water in a copper, or other vessel, closed with a lid, with an open tube inserted into it, to conduct steam into the vats or pits. Inside these the steam should be conducted through *wooden* tubes, (as metal would injure the colour of the leather) to nearly the bottoms of the vats, where they should be left open, for the heat to ascend and diffuse itself throughout.

ROMAN ROADS.—The Roman Roads were much narrower than ours, the width of the carriage-way, as prescribed by the laws of the twelve tables, being only eight Roman feet, but their carriages were also narrower than ours, the width of the wheel track not being more than three feet. The paved part of their great military roads was wider, being sixteen Roman feet, with two side ways, each eight feet wide, separated from the middle way by two raised paths of two feet each; so that the entire width of the principal military roads did not exceed from thirty-six to forty feet. The whole depth of materials was about three feet, and built in a most solid manner.

There were twenty nine military roads leading from Rome, some of which extended to the extreme parts of the empire—their total extent being according to Rondelet, 52,964 Roman miles, or about 48,500 English miles.—*Tredgold on Rail Roads.*

LIST OF NEW PATENTS.

NEW PIGMENT.—To Wm. Duesbury, of Bosel, Derby, for a mode of preparing a white, from the impure native sulphate of barytes. 29th Sept. Six months.

STEEL.—To J. Martineau, Jun. City Road, and H. W. Smith, of Laurence Pountney Hill, for improvements in the manufacture of steel. 6th Oct. Six months.

LOCOMOTIVE APPARATUS.—To Sir Geo. Cayley, of Brompton, York, for a new locomotive apparatus. 6th Oct. Two months.

PIANO FORTES.—To James S. Broadwood, of Great Fulteney Stret, Golden Square, for improvements in small or square piano fortes. 6th Oct. Six months.

VAPOUR ENGINE.—To Thomas Howard, of New Broad Street, London, for his invention of an engine, to be denominated, a vapour engine. 13th Oct. Six months,

STEEL.—To Nathaniel Kimball, late of New York, but now of Falcon Square, London, for a new process for converting iron into steel. 13th Oct. Six months.

BUTTONS.—To Benjn. Sanders, of Broomsgrove, Worcester, for improvements in the manufacture of buttons. 13th Oct. Six months.

BUTTONS.—To Thomas Dwyer, of Lower Bridge Street, Dublin, for improvements in the manufacture of buttons.—

TO OUR READERS AND CORRESPONDENTS.

We regret to have to inform Juvenis, that the machine described in his communication has been in common use (*in public*) in London, for many years.

The subjects mentioned in our last as intended for insertion in the present number are unavoidably postponed.

Our other correspondents will be replied to in our next,

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REGISTER

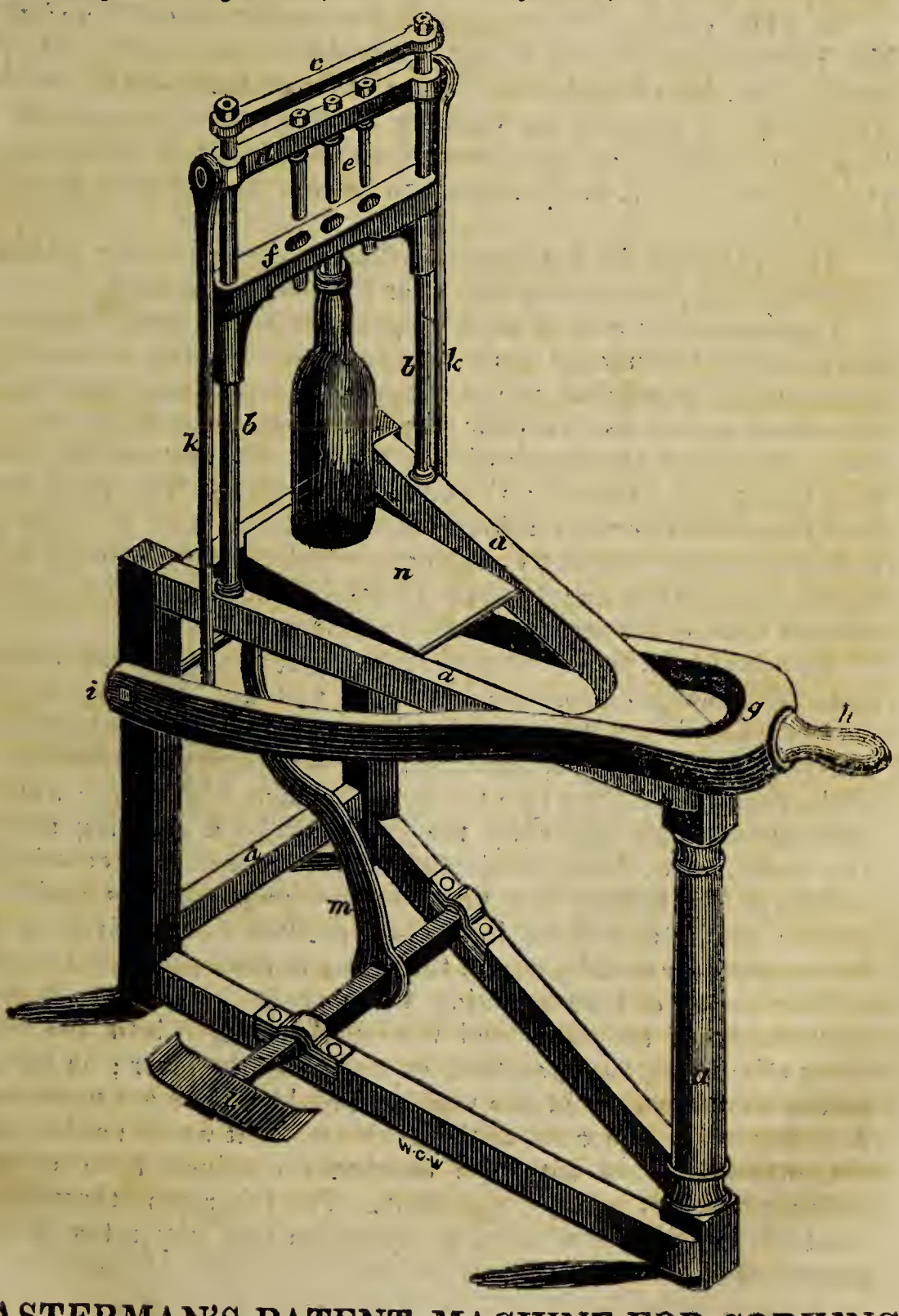
OF

THE ARTS AND SCIENCES.

No. 57.] SATURDAY, NOVEMBER 19, 1824. [Price 4*d*.

CONTENTS:

Masterman's Patent Machine for Corking Bottles, - - - - - 130
Maudsley & Field's Patent for changing the Water in Steam Engine Boilers, - 132
Sunderland's Patent Fuel, - - - 133
New Modification of a Crane, - - ib.
Magrath's Patent Water Pipes, - - 135
Schofield's Patent British Cachmere, - ib.
Hon. E. Cochrane's patent Dissolvent Lamps ib.
Taylor's Patent Gas Apparatus, - - 137
On the Heating and Cooling of Fluids, - 139
Horton's Patent Process in Manufacturing Wrought Iron, - - - - - 141
MISCELLANEOUS,—The New Suspension Railway, 141,—An improved Udometer, 142,—Improved Barometers, 143,—Light produced during the Crystallization of Benzoic Acid, ib.—An Infallible Remedy for the Dropsy, ib.—Amount of Property insured in England, ib.—Automato, ib.—French Watchmakers, ib.—French Printing, 144,—Aleppo Butter, ib.—List of New Patents, Correspondence, ib.



MASTERMAN'S PATENT MACHINE FOR CORKING BOTTLES.

MASTERMAN'S PATENT MACHINE FOR CORKING BOTTLES.

It cannot but have suggested itself to those who have considered the present mode of corking Bottles, that some improvement is very desirable, (particularly as regards the crushing of the corks, and the risk of breaking the bottles) ; and that it is also not a trifling desideratum that all temptation should be removed for continuing the very filthy practice of crushing the corks by biting them, which, being a quicker method than crushing them by any of the present machines for that purpose, is frequently resorted to, when the workmen (as is usually the case) are paid according to the number corked.

In a late number (53) we inserted a description (with a plate) of Mr. Thomas Masterman's Patent Apparatus for Bottling Liquids ; his brother, Mr. John Masterman, of 68, Old Broad St. has lately obtained a patent for a machine for Corking Bottles, which appears to us, from the simplicity of its construction, and its extreme effectiveness (having inspected it in operation) to bid fair to introduce itself into general use.

The patentee in his specification enumerates the following advantages as possessed by his, over the present method.

Common corks may be used (if preferred) with their larger ends downwards. Cylindrical corks may be used. Shorter corks may be used, and be as efficient as the common ones, because they may be introduced so far, as that their heads may be even with, or lower than, the top of the mouth of the bottle. Bottles can be corked with larger corks than by the common method. The time lost in biting the corks, or in crushing them by other means, is saved ; all risk of breaking bottles by corking is avoided ; and he adds, as the result, that bottles may be corked both in a better manner, and at a cheaper rate by his method, than by that now in use.

In addition to those several advantages, we observed that the corks from being *compressed*, merely, and not *crushed*, were as perfect when drawn from the bottles, as before they entered them. This is evidently of importance, as it entirely prevents any of the dust of the cork from falling into the bottle, which will happen when the corks are crushed either by the teeth, or by a crushing machine. The corks, also, being subjected at the moment of entering the mouths of the bottles to a pressure both on their tops and sides, become firmer and closer in the bottles than when driven in after having been crushed by any of the common methods.

The saving of time by using the machine is evident, from the compression of the cork, and the impulsion of it into the bottle, being effected by *one operation*, or motion of the lever ; in fact, ten bottles can be corked in one minute, provided it be not necessary to dash any of the liquor out of them, and which it would not be, should the bottles be filled with the exactness obtained from using the before-mentioned bottling apparatus. For this reason there seems a great advantage in combining in operation that apparatus with the present machine.

The following is a description of the machine (with reference to the preceding engraving), and of the manner in which it is worked.

a a a a a represents the frame,* two cylindrical pillars of iron, *b b* are fixed vertically into it, and parallel with each other, with their upper ends connected by the bridging piece *c*; *d* is a four-sided bar of iron, which traverses upon the upper parts of the said pillars, at right angles with them, by means of a hole near to each end of the bar; at *e* are three cylindrical metal bolts, or rods, which are termed by the patentee "the impellers," they are fixed to the bar *d* by passing through, and are secured to it by nuts on its upper face; *f* is a cross-piece of wood, fixed firmly to the pillars at right angles with them, and at such a distance from their tops, as that, when *d* is raised close to the bridging piece *c*, there may be a space between the bottoms of the impellers and the top of *f*, at least equal to the length of a cork. In *f* are fitted three conical metal tubes, shewn in the engraving as immediately under the impellers, or, as the patentee states it, having common centres or axes with them respectively. The largest tube has its top larger and its bottom smaller, than the largest sized cork required, the smallest tube has the same relation to the smallest cork required, and the middle tube is of a size between the other two.

Three different sized tubes are stated to be sufficient for quart bottles, whether for wine, or beer. The bottoms of the impellers are smaller than the lower orifices of their respective tubes. *g g* are two levers, connected together at the handle *h*, an iron rod passing through the two square posts of the frame forms their fulcrums; *k k* are two iron rods, their upper ends work on two gudgeons formed on the ends of the bar *d*, their lower ends work on pins fixed in the lever *g* at corresponding points; *l* is a treadle, which, by means of the iron rod *m* fixed to its axis, raises and depresses the wedge *n*, this wedge slides on a cross piece of wood (firmly fixed to each side of the frame *a*) in such a manner that the upper surface of the wedge is always preserved in a horizontal position, a loop of iron is affixed to the bottom of its thicker end, through which the upper end of *m* works.

The machine, as above described, is ready for use:—the workman being seated by the side of the machine with his right foot on the treadle, places the bottle, so that its mouth is under and in contact with that tube which is of the proper size for introducing the cork into it, he retains the bottle in this position by raising the wedge up to its bottom, by means of his foot acting on the treadle; then raising the impellers, by means of the lever, he puts a proper sized cork into that tube which is in contact with the bottle; he then depresses the lever, by which action the cork is forced by the impeller into the neck of the bottle; then lowering the wedge by the pressure of his foot on the treadle, he removes the bottle, which completes the operation.

* We understand that the frames of the machines will in future be constructed both lighter and neater than the one represented.

MAUDSLEY & FIELD'S PATENT FOR CHANGING THE WATER IN STEAM ENGINE BOILERS.

This invention consists in a method of continually changing the water in steam engine boilers, especially applicable to those used in steam vessels, on account of the great deposition of salt and calcareous matters on the bottoms and sides of the boilers, when sea water is employed for the production of steam. This effect is found to be peculiarly inconvenient in making long voyages, as the vessels are in consequence under the necessity of being stopped every fifty or sixty hours to empty their boilers of the brine, and refill them anew with the sea water. If the heat be continued after a considerable deposition of the salt has taken place, the boilers thereby sustain serious injury, and steam can then be raised only by an increased expenditure of fuel.

It appears, therefore, that the discovery and invention of a means by which the water may be continually refreshed during the progress of a vessel, is one of real public utility; and as a point of economy, it is of no less importance, by preventing the destruction of the boilers, or rendering them of much greater durability.

The patentees state, that from twenty to thirty per cent. of the quantity evaporated being taken from the concentrated brine will keep the water within a degree of saltness, from which no practical evils can result, however long the boiling be continued; the quantity thus abstracted from the boiler being of course replaced by a like quantity of sea water in its natural state.

The abstraction of the brine is to be made by means of a small pump, with a loaded discharge valve, worked by the engine, and so proportioned as to draw from the lowest part of the boiler the quantity determined upon; which may be regulated by a meter shewing the quantity of water driven off in the form of steam.

The operation of the pump is however not to commence until the brine has attained a considerable degree of concentration; it should, for instance, contain five times as much salt as common sea water; after this, every stroke of the engine may be made, by means of the pump, to take *as much salt out of the boiler, as is deposited in the boiler by the steam used in that stroke*.* By these means the water

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* As this may not be readily understood by some of our readers, we shall here endeavour to explain it, by a very simple statement, in figures.

The water of our seas (the German Ocean for instance) contains about 3lbs. of salt in 100lbs. of water; a boiler therefore that contains 1000lbs. of sea water will hold in solution about 30lbs. of salt. By evaporation the pure water is driven off, leaving the salt; and constant additions of sea water being made to supply the waste by evaporation, the water in the boiler gradually increases in saltness until it contains five times as much salt as common sea water. The 1000lbs. of water in the boiler will in consequence contain 150lbs. of salt. Now supposing 200lbs. of pure water to be driven off in the form of steam, in a given time; and in the same period 50lbs. of the brine be extracted by the pump, the latter holding as much as 7½lbs. of salt in solution will take that quantity along with it. The total loss of the boiler is therefore 250lbs. of water containing 7½lbs. of salt, and this proportion of salt is exactly what is contained in 250lbs. of common sea water, with which the boiler has been replenished during the same period of time. Ed.

in the boiler can never exceed a certain predetermined degree of saturation; and whether the engine be working quick or slow, the quantity withdrawn may be always made to bear the same proportion to the quantity left in, thus avoiding one of the greatest evils and inconvenience to which steam vessels in making long voyages have hitherto been subjected.

To economise the heat and consequent expenditure of fuel, the patentees further propose that the hot brine extracted by the pump, be discharged into a vessel containing a series of metal pipes of small calibre, similar to a refrigeratory. Through these pipes which lie immersed in the hot brine, the supply water is to be made to pass, to abstract the caloric in its progress, and deliver the sea water into the boiler in a heated state.

SUNDERLAND'S PATENT FUEL.

This is a patent granted to a Mr. Thomas Sunderland, of Croom's Hill Cottage, Blackheath, for a new combination of fuel; it consists in a mixture of gas tar and clay, and refuse woody matter, in various proportions. One part of each of the two former, with two parts of either saw-dust, tanners' spent bark, dyers' refuse wood, peat, &c. burn extremely well. If equal parts of the tar, clay, and saw-dust be employed, they make a composition which burns vividly, and with a brilliant flame. The materials are to be thoroughly mixed, made up into lumps, and dried either artificially, or in the open air, preparatory to their being used for fuel.

This "*new combination*" of fuel being the subject of a recent patent, our readers will excuse us for giving it insertion, and when we assure them that we do not present it to their notice as a *new discovery*. Such mixtures as the above may possibly form a convenient substitute for coals, when the latter are very scarce and dear, but we question much the economy of using such a substitute for coals generally.

NEW MODIFICATION OF A CRANE.

"*To the Editor.*

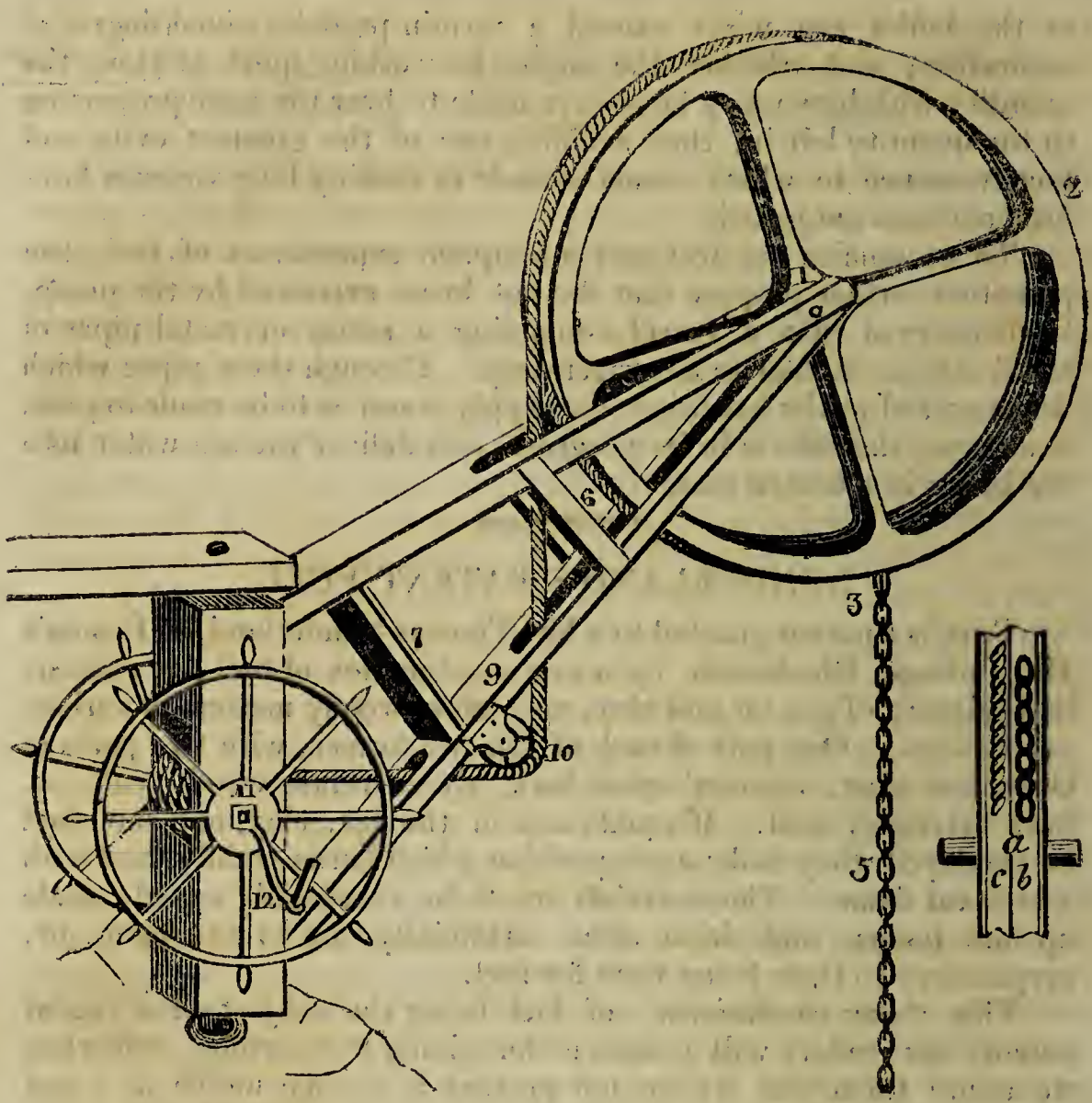
"Sir,

"Visiting the London Docks last week my attention was arrested to the circumstance of the slow delivery of goods by the present plan of the jiggers, the handles of which required to be turned an inconceivable number of times 'ere the smallest articles from the lighters were landed.

"Now, Sir, I do not profess to be skilled in mechanics, but it appears to me that the accompanying plan if put into practice would obviate the above-named objection to those in general use.

"A man at each wheel might command a vast power over the lever wheel, which if not sufficient could be aided by two or four more men at the handles.

"W. S. C."



Reference to Engraving.—" 1, Fly wheel;—2, surface of wheel, a portion of which is shewn at separate figure *a*;—3, the point of wheel at which is fixed the bearing chain to run in groove *b*;—4, point of wheel at which is fixed the lever rope to run in groove *c*;—5, bearing chain of the length of wheel's circumference; 6, and 7, stays to support 9; 10, duct wheel to spindle 11; 12, hand winch."

[With the desire of encouraging every attempt to improve machines of such great utility as cranes, we have inserted the preceding communication; but we cannot agree with the writer in his opinion as to the " vast power" which a man would command at the handles. It appears to us that it would require a strong man to raise by their means four hundred weight besides the bearing chain; and that it would require the united power of six or eight men at the handles and winches to raise one ton.

The machine is calculated for raising small weights quickly, but the power is wholly inadequate to the weights *occasionally* to be raised at the London Docks. That the writer (W. S. C.) is a man of talent is evident from the excellent perspective of the rough sketch of the machine accompanying the communication, but he appears not

to have been fully sensible of the truth of that invariable rule in applying the mechanical powers, that whatever is gained in time is lost in power.]—Ed.

MAGRATH'S PATENT WATER PIPES.

The object of the invention which is the subject of this patent, is the preservation of water and other liquids from the effects of frost. The pipes or other vessels that conduct or contain the liquid are to be surrounded with some material that is a bad conductor of caloric, thereby to prevent the atmosphere, however cold, from abstracting the heat from the liquid, and consequently to preserve the latter in its fluid state.

The method adopted by the patentee, is to enclose the ordinary pipes, through which the liquid flows within another of sufficiently large dimensions, to admit of a vacant space between them throughout their length; the pipes are to be kept apart by wedges of cork, or other suitable material, and the vacant spaces filled up with pulverized charcoal. If necessary, the conducting pipe may have several casings one within another, and the interstices between each packed with a non-conducting material. In the same manner cisterns or reservoirs of water, and other liquids, may be made with one or more external casings, with several interposing strata of charcoal.

SCHOFIELD'S PATENT "BRITISH CACHMERE."

This invention consists, as its name implies, in a process for making a peculiar fabric in imitation of the real cachmere.

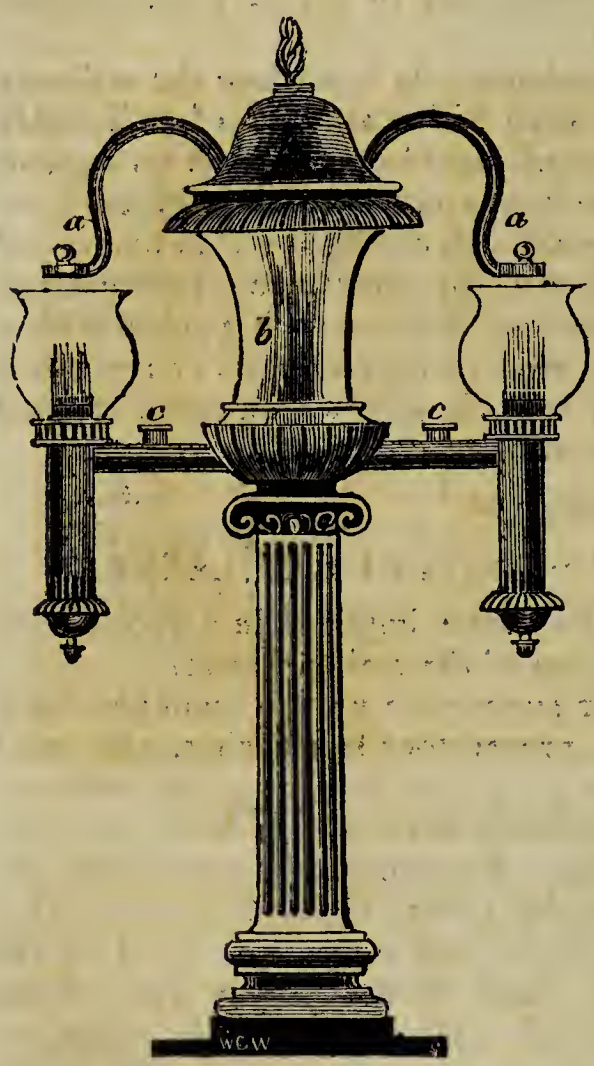
The woollen yarn or thread for making the warp is spun peculiarly fine, then doubled and twisted; preparatory to weaving, this twist is now to be taken out, and the weaving executed as in the ordinary way of plain weaving. This done, the pile is to be raised by carding, the cloth sheared, and then fulled. These operations complete, the cloth is to be rolled upon a wooden roller, tightly and smoothly; then boiled for three or four hours, and afterwards dyed of the intended colour. It is now to be dried by drawing it from off the wooden roller between hollow metallic cylinders heated by steam, on to another wooden roller, repeating the operation till it is thoroughly dry.

HON. E. COCHRANE'S PATENT DISSOLVENT LAMPS.

Singular as it may appear to some of our readers, we were not even acquainted with the existence of this excellent invention, (although of two years or more standing) until about a week since, when in passing through Regent Street our attention was arrested by the effulgence of the light proceeding from these lamps, in the shop of Mr. Jose, (No. 118), who is the agent and manufacturer of them. Their utility and convenience appearing to us, upon inspec-

tion, to be unquestionable, we thought many of our readers might like to be made acquainted with their use and construction.

The object of the invention appears to be,—to render tallow, cocoa nut oil, (otherwise butter of cacao) and all other concrete oils or fat, fluid ; by conducting a considerable portion of the heat given out by the flame of the lamp into the tallow, &c. thus liquefying them and causing them to flow, like the naturally fluid oils, to the wick of of the lamp to be consumed. When tallow or kitchen fat is thus employed, the combustion is so perfect that a very rich and brilliant light is given out, unattended with the emission of any odour or smoke.



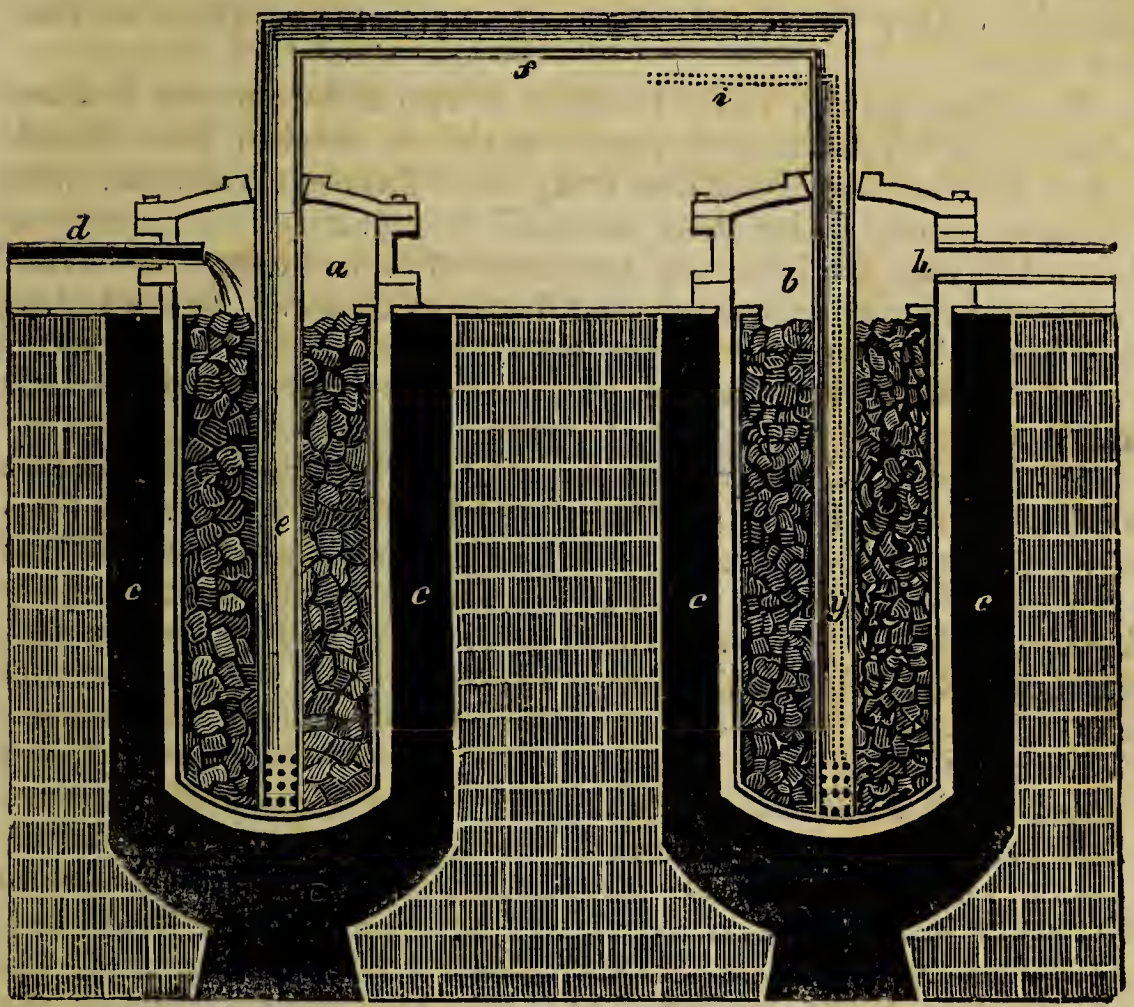
a a are two solid bent metal rods that conduct the heat received from the flame of the lamp to the tallow contained in the reservoir *b;* the ends of these conductors are therefore made to descend to the bottom of the reservoir. *c c* are two apertures (with covers that screw on) made in the supply pipe, for the purpose of pouring in a small quantity of melted tallow upon lighting the lamp, after which the heat from the combustion being conducted into the reservoir, the supply of fluid tallow is uniformly kept up until it is all consumed.

From the circular given to us by Mr. Jose, on the occasion of our calling at his shop, we extract the following observations on the advantages attending the use of these lamps.

"To those acquainted with the superior combustible properties of *Tallow* and *Cocoa Nut Oil,* it is unnecessary to say more than that *these Lamps effectually melt and burn both;* and that the price of the latter, at the manufactory, is 2*s.* 6*d.* per gallon! but to others, to whom their good qualities are less known, it is necessary to state, that from the comparatively small portion of oxygen necessary to complete their combustion, the *total absence of smoke and smell is ensured,* and the brilliancy of the flame is such as no lamp ever before produced, and nothing but the best gas light can equal.

"To families who kill their own meat, innkeepers, proprietors of cook shops, &c. &c. a two-fold advantage will be found in the use of these lamps, as it is *not merely Tallow that they burn, but Grease of every description,* such as *dripping, pot skimmings,* &c. &c. a pound

of which, value about 3d. will continue for full twelve hours, in a common-sized dissolvent argand burner, to yield light *equal to eight candles*, being no more than a farthing an hour !"



TAYLOR'S PATENT GAS APPARATUS.

The above diagram is illustrative of an improved apparatus for the obtaining of gas for illumination from various substances, and for which a patent was recently granted to Mr. Philip Taylor, of the firm of Taylor and Martineau, in the City Road, so well known to the Scientific World for their previous valuable improvements in this important branch (as we must now term it) of our manufactures.

This apparatus being adapted for the distillation of liquid substances only, all solid matters capable of producing the carburetted hydrogen gas, must undergo partial decomposition by heat to reduce them to a fluid state, previous to their introduction into it.

When the liquid matter introduced into the retorts is of easy decomposition, one distillation of it, though a single retort, will in general be sufficient to separate the gas in a tolerable pure state. When they are however such as require a longer process, the gaseous products of the first distillation are passed into a second retort, to complete the separation of the contaminating matter. As many as ten retorts similar to those shewn in the engraving may be conveniently arranged over one furnace. In the case of a single distillation

it is therefore to be understood that these are all supplied at once with the fluid matter, and the product of each retort respectively is carried from them direct to the gas-holder; but when a second distillation is necessary, the ten retorts before mentioned would be employed as five pair; and the diagram is drawn so as to shew the operation either by a single or by a pair of retorts, which we shall now explain.

The figure gives a vertical section of two cast-iron retorts *a* and *b*, fixed over a furnace constructed with fire bricks; their length may be estimated at about four feet; their form is cylindrical, with covers accurately fitting their necks so as to render the vessels air tight when they are luted on, and fastened down by keys or screws. They are placed or suspended erect in the brick work, by resting on their projecting flanges, leaving open spaces around them, as at *c c c c*, by which very extended surfaces are exposed to the immediate action of the fire.

Within each of the retorts a casing or shell of wrought iron is placed exactly fitting the interior; these are filled with fragments of bricks, stones, coke, metal, or any substance that will bear a red heat without fusing; and as these materials frequently require shifting, each case is provided with ears, rings, or lugs, for the convenience of drawing them out or letting them down into the cast-iron retorts. Vertical tubes, *e g*, are placed in the centre of each retort; they are connected at their upper ends by the horizontal tube *f*, and passing through the covers, their other ends descend to the bottoms of the retorts, where they are perforated with holes, as shewn in the figure. The internal cases, previously empty, are then filled with the broken bricks and various mineral substances before-mentioned, and the covers and joints being all properly luted and secured, the retorts are exposed to the action of the fire until the materials acquire a red heat. Thus prepared for the operation, the fluid to be distilled is allowed to flow through the pipe *d*, in small quantity into the retort *a*; here falling upon the red hot materials, the process of decomposition commences, which is assisted by the filtration of the liquid through these substances. Having arrived at the bottom, the gaseous portion passing through the perforations, rises up the tube *e*, from thence proceeding along the branch *f*, it descends into the second retort *b*, by the pipe *g*, and passing out again through the holes at the bottom of *g*, the gas re-ascends among the ignited materials, being purified in its progress, until it arrives at the tube *h*, which conducts it to the gas holder.

When the whole operation consists in a single distillation in one retort, the fluid is introduced by means of a pipe *i*, shewn by the dotted lines. In this case the tube *g* does not extend higher than the cap of the retort, in the centre of which the pipe enters and passes down the middle of the tube *g* to within six inches of the bottom; from thence the liquid, flowing through the perforations among the red hot materials, becomes quickly decomposed, and the resulting gas, filtering as it ascends, reaches in nearly a pure state the tube *h*, which conducts it, as in the former case, to the gas holder.

It will be noticed, that the substances in the second retort are in larger fragments than those in the first retort, which is an arrangement found to be advantageous, and therefore recommended by the patentee in his specification. In operating by single distillation the largest fragments are to be thrown in the retort first, and the smaller on the top, which is a disposition similar in effect to the former.

Cast-iron is not considered by the patentee as the essential material for the construction of the retorts; they may be made of fire clay, and various other substances; but a preference is given to cast-iron as the most economical and convenient. There is, likewise, no particular material specified for the production of gas, the apparatus being considered alike applicable for the distillation of *all* fluid matters from which carburetted hydrogen may be obtained.

ON THE HEATING AND COOLING OF FLUIDS.

"*To the Editor.*

"SIR,

"HAVING noticed in the Register of Arts descriptions of several recently patented inventions either for the purpose of heating or the cooling of fluids, by the simple process of passing them through a series of pipes of very small calibre immersed in, or surrounded by, a medium of a higher or lower temperature, it will be perhaps satisfactory to many of your readers to see the principles on which an apparatus of this kind operates, clearly demonstrated. In a pamphlet now before me, written by a gentleman whose scientific attainments and great designs have not passed by you unnoticed, these matters are so ably explained, that I am induced to send you the enclosed extract for insertion, if sanctioned by your approbation.

"Some great philosopher has observed that all our motives are of a mixed nature; it is therefore perhaps needless for me to say that the motives which prompt me to send you this paper are at least twofold; first, an ardent desire for the promulgation of useful knowledge; and, second, a love of justice. Now whether the latter feeling predominates I cannot tell, but it compels me to add that the abovementioned pamphlet was published prior to the date of the patented inventions alluded to.

"Yours, &c.

"PRO BONO PUBLICO."

"'In pipes of very small calibre, fluids (whether products of combustion, and vehicles of caloric, or whether ponderable and recipients of it), are caused to expose so much surface, and become posited in a way, which allows of the communication or abstraction of caloric, to or from them, with more rapidity, than any other state in which they can be placed.

"'For the periphery of the pipe not only causes them to expose more surface than can be exposed in any other practical apparatus, but also does its small diameter, and consequent capacity, cause the fluids passed through it, to become liable to the production of the

greatest possible effect (whether heating or cooling), with any given means. For instance: a cubic inch of fluid, passed through a pipe, the calibre of which is equal to a square inch, fills only one inch of the length of that pipe, and exposes a surface of 3.5 inches. But a cubic inch of fluid, passed through a pipe, the bore of which is only one-tenth of an inch, fills above 127 inches of that pipe, and exposes a surface of forty square inches.

"'The circumstance on which rapidity of effect, whether as to cooling, or heating depends, is exposure of surface; and the circumstances on which the production of the greatest possible effect, with any given means (whether as to cooling or heating) depends, are exposure of surface and continuity of contact; both of which are effected in the apparatus that has been referred to. Since in it, a cubic inch of fluid, exposes nearly twelve times as much surface as it would expose in a pipe with a calibre equal to a square inch; and is in contact with the abstracting medium 127 times as much, or, 127 times as long, as in a pipe of that calibre. Now, fluids being imperfect conductors of caloric, the extremities of a cubic inch of any one of them, in a pipe, the area of which is equal to a square inch, are not sufficiently distant, to admit of its losing several degrees, or perhaps even a degree in that space. But a pipe, in which a cubic inch of fluid, occupying 127 inches of its length, becomes as it were a wire of fluid, or wire-drawn, and in which the extremities of that cubic inch are 127 inches apart, furnishes space for many variations of temperature between any two given points.

"'Allow me to suppose, for example, a fluid tem. 53° to be passing through a pipe of this area, immersed in water, tem. 52°, at a rate which shall emit it from the pipe the moment it is reduced to 52°. As, in this case, it can lose only one degree in going the whole length of 127 inches, and as it is emitted from the pipe the moment it has lost that degree, every inch of its length must vary in temperature 1-127th. of a degree.

"'Again, allow me to suppose that water, tem. 179°, is passing through the seven small pipes enclosed in the large one, as shewn by the diagram, while an equal quantity of water, tem. 52°, is passing in an opposite direction through the large one. These pipes being 127 inches long, and the water being emitted from the inner ones the moment it is reduced to 53°, and that from the outer one as soon as it is heated to 178°, the two fluids must, in this case, differ in temperature one degree at every inch of their length. At the end, where the hot water enters, it is 179°; an inch from that end it is 178°; an inch farther 177°; and so on: while at the opposite end, the cold water is 52°; an inch from that end 53°; an inch farther 54°, and so on. Now it is the positing fluids in this way, that admits of producing the greatest effect (whether as to cooling or heating) with any given means. For when a cubic inch of fluid, occupies a length only of an inch, it

remains of so uniform a temperature, as prevents the abstraction of minute increments of caloric, by minute portions of the colder fluid. But when occupying a length of many inches, the two extremities of a cubic inch of fluid may be of temperatures so widely different, as to admit of minute portions of the fluid made use of to cool or heat it, abstracting or communicating minute increments of temperature; and as these increments increase in number and effect with the length of the pipe, diminution of calibre necessarily adds to their efficacy; and as this is effected to the greatest possible practical extent, in pipes of only one-tenth of an inch in diamete, the greatest possible effect, whether as to communicating or abstracting heat, and whether as to gaseous, or ponderable fluids, is necessarily produced by apparatus of this nature."

HORTON'S PATENT PROCESS IN MANUFACTURING WROUGHT IRON.

After crude iron has been decarbonized in the "puddling" furnace, and thereby converted into wrought iron, the metal is separated and made up into lumps or "billets." These billets are then *separately* passed between grooved cylindrical steel rollers actuated by a great power, which reduces them into bars or sheets, or any required form or thickness. But as only one billet at a time is used, the length, breadth, or thickness of a single piece of iron so formed must necessarily be very much circumscribed; and to obtain bars of greater dimensions than they are made by this process, it has, we believe, been the usual practice to weld several bars together.

Mr. Horton's improvement simply consists in uniting several o the billets together as they come from the puddling furnace, an subjecting the united mass to the operation of the rollers. The advantages that result from this variation in the process we have not heard stated, but it seems to us reasonable to expect the following; viz. the iron may be worked in one uniform solid piece, of a greater length, breadth, or thickness, by a single operation; the sum of the separate surfaces of the billets being greater than the single surface of the united mass, the latter will be less exposed to oxidation when under intense ignition, consequently, a reduction of the waste of the metal by scaling off; lastly, the metal will be much improved, by the increased working under the rollers to produce a given thickness, which disposes it to assume a more laminated and fibrous texture longitudinally, conferring thereby a greater degree of toughness, malleability, and tenacity.

MISCELLANEOUS INVENTIONS,
Discoveries, & Processes in the Useful Arts.

The New Suspension Railway.—We are much gratified in learning that the superior facilities and advantages afforded by Mr.

H. R. Palmer's Patent Railway (described in our 7th Number), are beginning to be manifested by its adoption on several extensive lines of road. It affords us also pleasure to notice that Mr. Tredgold, in his recent work on the Construction of Railways, has pointed out a judicious method of obviating the only difficulty, or rather objection, that has been started to the application of these excellent principles in our *great turnpike roads* on account of the numerous crossings.

Mr. Tredgold says, (page 37)—

"We expect that this single rail road will be found by far superior to any other for the conveyance of the mails and those light carriages of which speed is the principal object; because, we are satisfied that a road for such carriages must be raised so as to be free from the continual interruptions and crossings of an ordinary rail-way. A carriage moving at a greater rate than about six miles per hour, on a rail-way, must be raised so as to remove the possibility of running over people, or of dashing against other vehicles. Carriages running smoothly and rapidly with a small moving power, cannot be checked suddenly; and they admit of no change of direction. But, were a railway elevated ten feet above the common roads, these accidents could not take place, except through neglect; the passengers would not be raised to a much greater height than the top of a common coach, and in a suspended carriage, which could not possibly overturn. A road of this kind would be more free from interruption than any other; and a velocity sufficient for any useful purpose may be obtained at a small expense of power."

An improved Udometer, to shew the quantity of Rain fallen.—A circular basin is made of tin plates, or copper, the exterior edge of which is double, so as to form a canal around it; about half an inch from the bottom of this vessel an aperture is made, in order that the water may never fill this basin, but escape through the aperture into a cylindrical receiver below. In this receiver a vertical slit is made from the top to the bottom, and being hermetically closed by a strip of glass, the height of the surface of the water is thereby always shewn, and accurately measured by a scale, divided into inches and parts, fixed alongside; a tube closed by a cork is fixed to the lower part of the vessel for emptying it when full of water. This basin is connected by means of a tube above with another basin of less dimensions, which is surmounted by a cylindrical reservoir, provided as in the before-mentioned, with a vertical slit covered with glass; and likewise with a scale lengthened in the ratio of the difference of the diameter of the two basins. This reservoir is constructed much like those used to supply oil to the wick of an argand lamp, it is therefore filled with water on being put into its place, and by means of the tube of communication the larger basin is always replenished with the precise quantity of water that escapes from it by evaporation, when no rain is falling.

The index to the larger vessel shews, therefore, pretty accurately, the quantity of rain that has fallen into the basin, while the index to the smaller one exhibits in like manner the quantity that has evaporated from it.

Improved Barometers.—It having been found that air finds its way into the best made barometers, by creeping up between the glass and the mercury, Mr. Daniell has contrived the following remedy. A narrow ring of platinum is to be welded to the open end of the barometer tube which is immersed in the cistern, it being well known that boiling mercury amalgates itself with platinum, and adheres to it when cold, so that the passage of air is thus effectually prevented.

Light produced during the Crystallization of Benzoic Acid.—M. Buckner, of Magonza, having mixed impure, yet dry, benzoic acid, with a sixth part by weight of powdered charcoal, left it exposed for several days at a moderate heat. The crystals had begun to form, when M. Buchner, to expedite the operation, placed the apparatus in a stove of high temperature. Half an hour afterwards brilliant flashes of light were emitted from the mixture, and continued for half an hour. The flashes ceasing when each crystal was deposited, caused M. Buchner to consider that the light was produced by a neutralization of electricity. Similar phenomena have been observed in other salts; and Mr. Dobreiner is of opinion that those salts which contain no water of crystallization, are particularly powerful in producing light during the formation of their crystals.

Infallible Remedy for the Dropsy.—One of the Paris papers contains a letter from Mr. Langsdorff, consul-general of the Emperor of Russia to the Brazils, in which the consul mentions a very important discovery, viz. an Infallible Remedy for the Dropsy:—it is the root of a kind of endive, called in that country, cainca. Some pounds of this root, it is stated, have been sent to Russia, Berlin, and England. Dr. Koreff, who now enjoys at Paris the same reputation he possesses at Germany, but particularly at Berlin, his native place, has also received a great quantity of this precious vegetable, sufficient to divide among several physicians and chemists, who will put it to the test of experience and establish its efficacy. The cruel disease which it is hoped this plant will cure, is so frequent and so obstinate in spite of the means hitherto employed, that such a discovery will be of the greatest importance to humanity.

Amount of Property insured in England.—By official returns from all the Insurance Offices, the amount of property thus insured is calculated at four hundred and thirty-nine millions and a half of pounds sterling.

Automato.—A watchmaker of Bayreuth has constructed a cage filled with birds, to the number of sixty, representing parrots, sparrows, swallows, &c. each of which is made to warble in its natural note. The feathers upon the birds are real; the internal mechanism that produces the sound is of silver; and the cage is of brass. It is said that a person of high rank has offered the watchmaker 32,000 florins for his cage of birds, but that he refuses to take less than 60,000.

French Watchmakers.—There are in the city of Paris only, 520 watchmakers, who employ about 2056 workmen, and produce annually

80,000 gold watches, 40,000 silver watches, and 15,000 clocks, the whole worth about 19,765,000 francs.

French Printing.—There are eighty printing establishments in Paris only, occupying 3000 workmen, moving 600 presses, consuming annually 280,800 reams of paper, yielding a receipt of 8,750,000 francs. This is exclusive of the large government establishment.

Aleppo Butter.—To make butter at Aleppo, they tie a jar, filled with cream, to two trees, with supple twigs, and then swing it about long enough to make very good butter.

LIST OF NEW PATENTS.

WEAVING.—To J. C. Daniel of Stoke, Wilts. for improvements in machinery applicable to the weaving of woollen cloth. Oct. 13th, Six months.

STEAM CARRIAGES.—To Josiah Easton, of Bradford, Somersetshire, for improvements in locomotive or steam carriages, and in the construction of the roads or ways for the same to travel upon. Oct. 13th. Six months.

DRESSING OF CLOTH.—To W. Hirst, J. Wood, and J. Rogerson, of Leeds, for improvements in machinery for raising and dressing of cloth. Oct. 21st. Six months.

PUMPS.—To R. S. Pemberton, and J. Morgan, of Llanelly, Carmarthenshire, for a consolidated or combined drawing and forcing pump. Oct. 21st. Two months.

GENERATING OF STEAM,—To Goldsworthy Gurney, of Argyle Street, Oxford Street, for an improved apparatus for raising or generating steam. Oct. 21st. Six months.

STEAM ENGINES.—To L. W. Wright, of Princes Street, Lambeth, for improvements in the construction of steam engines. Oct. 21st. Six months.

REFINING SUGAR.—To Henry Constantine Jennings, of Devonshire Street, Middlesex, for improvements in the process of refining sugar. Oct. 22nd. Six months.

TO OUR READERS AND CORRESPONDENTS.

W. S. and J. B——n are informed that No. 25 (recently out of print) is now republished, and may be had of any bookseller or newsman.

A Burner of Portable Gas will see in our next number a description of the patent valves by which the emission of the condensed gas from the reservoirs is so nicely regulated, as well as the ingenious means adopted for transmitting it from one veesel to another.

The inverted arches in C. B.'s Suspension Bridge would, in proportion to their weight, tend to weaken the structure instead of to strengthen it. On points of a less obvious nature we should be more diffident in giving an opinion, as our knowledge in such matters, we are free to confess, is very limited. Let, however, C. B. enquire of any professional architect, and if his opinion does not coincide with our own, we will from henceforward be mute on such subjects. C. B. has, nevertheless, our best thanks for the preference given to our Work by his intended favour—and we sincerely hope that he will not be discouraged in the pursuit of a study for which he is, in many respects, eminently qualified.

A-propos, on the subject of bridges—our next No. will contain the description of a new suspension bridge of extraordinary simplicity and usefulness.

The favours of our other Correspondents, which are at the present moment mislaid, will be either inserted, or duly noticed, in our next.

The New Patent Endless Lever Action. We regret that Mr. Burnett's letter, in reply to Mr. Curtis's observations in our last number, came too late for insertion; it will certainly appear in our next.

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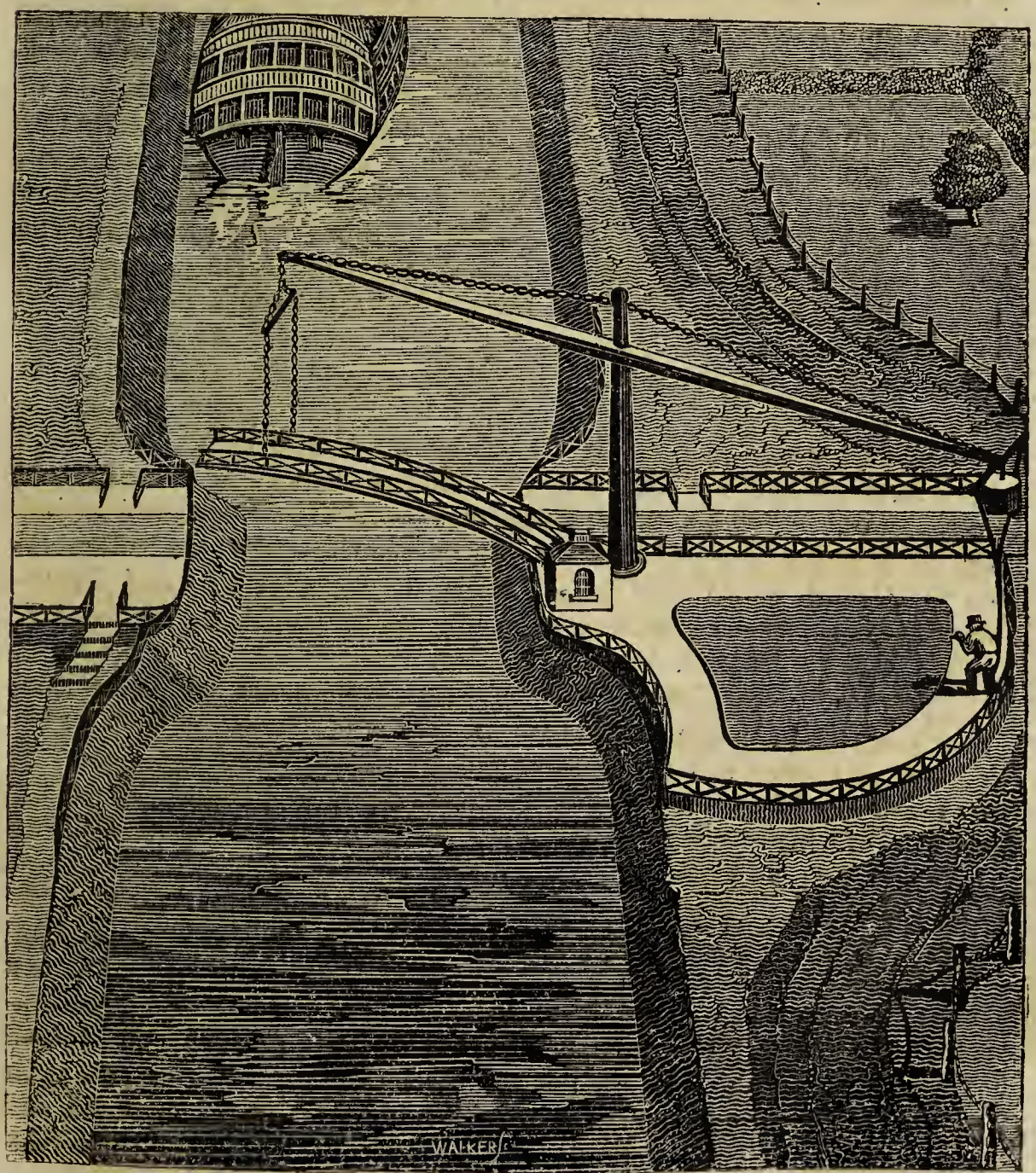
CONTENTS:

Mr. Cundy's New Patent Suspension Bridge 146
Whitehouse's Patent Gas Tubes - - 150
Robinson's Patent Preparation of Barley and Groats - - - - 151
New Patent Endless Lever Action - 152
Apparatus for Lighting Steam Boats - ib.
Hobbins's Patent Gas Apparatus - - 153
Barlow's Patent Process in refining Sugar 156
New Process of rectifying Spirit . - 157
Crossley's Patent Lamps or Lanterns - 158
MISCELLANEOUS:—Eves's Steam Engine, 158,—Wadsworth's Steam Generators, ib.—Model of England, ib.—The Patent Anti-attrition, 159,—To make Bronze, ib.—Ultramarine, ib.—Gold Trinkets, ib.—Porter, ib.—The Dog, originally an Inhabitant of the New World, ib.—Letters of Enquiry, 160,—Correspondence, &c. ib.



COUNTERBALANCE CRANE SUSPENSION BRIDGE.

A BIRD'S-EYE VIEW OF THE NEW PATENT
COUNTERBALANCE CRANE SUSPENSION BRIDGE,
AS PROPOSED TO BE ERECTED OVER THE
Intended Grand Ship Canal from London to Portsmouth;

Invented by N. W. CUNDY, Esq. Architect and Civil Engineer,—including a Description of the LINE OF THE CANAL.

WE are much gratified in learning that Mr. N. W. Cundy's project for uniting London to Portsmouth by a grand navigable canal, adapted not only to the free passage of deeply laden merchant-men, but to ships of war of the largest class, is likely to be soon carried into effect. The expence attending the execution of a work of such stupendous magnitude, seems to have been considered by the public at large, as a mere feather in the scale, when opposed on the other side to the immense benefits that cannot fail to result from its adoption. They have indeed justly seen, that the cost to the nation would be nothing, that it would, in fact, be merely a distribution of several millions of idle capital among the most deserving portion of the community; that while industrious thousands would be compensated for their labour with the *principal* laid out, the money lenders would, in all probability, receive a liberal *interest* in return for the advance of their capital; besides the satisfaction of having contributed to the accomplishment of one of the noblest and most useful national works ever undertaken by this or any other country. As these points have, however, been discussed by abler pens than our own, in the diurnal and periodical press generally, we fear our following them in this respect would be deemed a work of supererogation. We shall, therefore, confine our description of this undertaking to a few general statements, for which we shall become indebted to a pamphlet just issued from the press, and now lying before us, entitled, ["Reports on the Grand Ship Canal from London to Arundel Bay and Portsmouth, with a Plan and Section of the work, Notice to Parliament, and Prospectus, by N. W. Cundy, Esq."]

"LINE OF THE CANAL.—The canal will commence at Rotherhithe, nearly opposite to the London and West India Docks, and will proceed from thence in a south-west direction, to Walworth Common, by the foot of Brixton Hill to Streatham Common; then between the towns of Mitcham and Tooting, to Morden, Ewell, Epsom, Leatherhead, and Dorking; over Holmwood Common to Ockley, and the Roman Turnpike Gate, a little below Slinfold; down the vale to Pulborough, by Hardham, Greatham, Amberley, Burkham, Arundel; and, lastly, to Chichester Bay, Langston Harbour, and Spithead.

"The line of the canal is remarkably straight, and will take a direction so fortunately, as not to deteriorate any town or village in its course, running through a considerable portion of common and open lands; and thus rendering a work of this magnitude less objectionable than any similar plan hitherto projected.

"It has not escaped the projector that such a measure might, at first sight, appear seriously inconvenient to public travelling; care, how-

ever, has been taken to avoid that occurrence as much as possible, and where it could not be prevented, arrangements are proposed, which it is conceived will fully obviate this objection, and secure the convenience of the traveller.

"*Description of Land, Level, &c.*—From the River Thames to Morden the ground is remarkably level, and composed of stiff loam, or brick earth; from Morden to Ewell and Epsom there will be extra cutting through a chalky under stratum to Leatherhead; from Leatherhead to Dorking it is nearly a level, under the winding of the hills in Mickleham Vale, through chalky under stratum, and a stiff loamy soil; in passing Dorking to Holmwood Common, there will be considerable extra cutting, on the average from 140 to 150 feet deep for about 4½ miles, partly through a bed of sandstone, chalk, and strong brick earth; from thence into a branch of the river Arun, near Ockley, and then proceed to the tide way at Pulborough; from thence the ground is level, through a strong, stiff clayey and sandstone soil, and will pass below Arundel, and enter the line of the present barge canal to Chichester Bay and Spithead.

"SUPPLYING THE CANAL WITH WATER.—As this canal is intended to be cut through the general level of the earth, it will receive an abundant supply of water flowing from its innumerable springs, and tributary streams, as feeders from the Mole, the Way, and the Arun, and which will overflow its banks at the appropriate places, provided for that purpose at the summit level and on the line of the canal.

"The water will have no perceptible current in the canal; yet it will be purified and changed every day by the flowing of the springs, &c. No mill stream, dam, or river, will be obstructed by this canal, as they will be provided for by cast iron tunnels, passing under its bed, so that the rivers, &c. may continue their present course.

"For the data of the annexed calculations we must refer our readers to the pamphlet itself.

GENERAL ESTIMATE OF THE EXPENCE OF THE CANAL.

	£.	s.	d.
To the excavation of the Canal, at £28,160 per mile, 64 miles, 28ft. deep, and 130ft wide, top water	1,802,240	0	0
To excavating the Basins at two extremities of the Canal, with Docks, Gates, brick and stone work, &c.	100,000	0	0
To Masons, Bricklayers, Carpenters, Smiths, Foundry-work to Locks, Bridges, Tunnels, Embankments, &c..	374,000	0	0
To purchase of Land, Timber, Houses, Good-will, Leases, &c.	250,000	0	0
To extra cutting from Dorking to Ockley, ...	500,000	0	0
Contingencies, & for extra cutting from Morden to Dorking, and from Arundel to Chichester Bay and Spithead, Puddling, &c. ..	415,420	0	0
	£3,441,600	0	0

ESTIMATED ANNUAL PRODUCE OF THE CANAL.

	£.	s.	d.
Arising upon 10,000 Vessels, ..	290,166	0	0
New created Trade from the Bristol and Irish Channels, ...	25,016	13	4
Inland Traffic in the line of Canal, from London to Portsmouth, ..	33,355	4	5
Total per annum,	348,538	12	5
Expences to be deducted for Pilotage, Repairs, and conducting the Concerns relating to the Canal, per annum, ...	40,000	0	0
Clear Income from the Canal, and applicable to a Dividend among the Proprietors, ...	308,538	12	5

The preceding statements are extracted from Mr. Cundy's Preliminary Report to the Directors of the Canal Company. In a second report, a circumstantial account is given of the cutting and embankment in every part of the line, with the names of every town, village, and farm house, the various strata, &c.; among the latter it is peculiarly worthy of notice, are limestone, chalk, clay, and sand, in abundance, especially valuable for building purposes; besides these, there have been noticed a building stone equal to the Portland, iron stone, and even a bed of coal. The detail of these circumstances will be read with peculiar interest by all those persons whose local situations are likely to be affected by the contiguity of the canal; and for that reason we regret that our confined limits prevent us from including them in our account.

All the public roads, which the line of the canal may intercept, will be provided for by the substitution of good bridges, and as these must necessarily be numerous, Mr. Cundy directed his inventive powers to the construction of a bridge which should combine the essential qualities of strength, durability, lightness, and facility of speedily opening and shutting, at the least possible expence; and our readers, we doubt not, will agree with us in opinion, that he has successfully exercised his ingenuity.

This bridge is delineated in our frontispiece as thrown over the grand canal; a first-rate ship of war is supposed to have just passed, and a man is exhibited in the act of closing it again. That a single man should have the power to do this with facility, and in less than a minute, constitutes one of the chief excellencies of the contrivance.

We have omitted to mention that the width of the canal is to be 150 feet, with a clear water way of at least 130, which will admit ships of the largest class to pass one another without difficulty. As only one ship will have need to pass the bridges at a time, the canal will be contracted at those parts to about half 130 feet; 65 feet may therefore be taken as the span of the bridge shewn in the engraving. The form of the arch of the bridge may be described as a small segment of a circle, or one in which the vertex is but slightly elevated above the chord. One end of it turns upon a pivot as a centre of motion, and to lessen the friction arising from the contact of large surfaces, a series of anti-friction rollers are provided which act upon a horizontal plane: the other end of the bridge is supported and held in suspension by a counterbalancing weight at the opposite end of a long lever beam. To open and shut the bridge it is therefore *swung* backwards and forwards, in a horizontal direction, the same as a gate. The manner in which this is effected we will now describe, though the extreme simplicity of the machine seems to render explanation unnecessary.

A strong massive column, or standard, is firmly fixed upright in the foundation of the abutments. At about 20 feet from the surface of the platform this standard becomes the axis* of a revolving long

* Since writing the above, a doubt has arisen in our mind whether we have not made a mistake in this part of our description. Upon inspecting the

horizontal beam, which carrying a swivel at each end stretches out the chains of suspension; the ends of these chains are secured to the standard about five feet above the beam by means of large moveable rings or collars. That chain which supports the bridge, after passing over the swivel at the end of the beam, is linked into two smaller chains; these are parted and stretched out by a cross bar, (about 16 feet long) from the ends of which they descend vertically, and are attached to each side of the bridge. The height of this cross bar above the bridge is such as to admit of a loftily loaded waggon passing freely underneath it; and the length of the same (16 feet) gives the breadth of the bridge, which will have a separate foot and carriage way. The bearing chain which supports the counterweight is attached, as before-mentioned, to the standard, and passing over its respective swivel at the end of the beam the weight is suspended to it, and properly secured. From this end of the beam an arm is made to descend, to which is fitted a cross bar or handle about breast high, adapted for the application of a man's force in pushing.

The weight of the moving part of the bridge is calculated at about six tons, and the suspension chains being attached at about one third the length of the span from the end, the weight supported by the chains is probably about four tons; the counterbalance must therefore be equal to four tons more, making eight tons; the bridge being in this manner supported, all that the man has to do is to overcome the friction upon the axis arising from the pressure of the weight suspended, in addition to that at the centre of motion or pivot of the bridge. Now supposing that in consequence of very coarse workmanship, or from the accumulation of dirt, the friction at the centres should amount to one ton, (which is very improbable) it will be seen that the power of a man operating upon a lever of such a great length, and walking through a space of 90 feet will be fully competent to the task.

When the bridge is shut and resting upon the abutments it is capable of bearing any required weight; and we presume that the bridges generally along the canal will be kept closed, that the free passage of carriages may not be interrupted, and only be opened to allow ships to pass. The small expence at which bridges of this simple construction may be made, and the facility with which they may be speedily opened and shut by the application of a small motive force entitles them to an extensive adoption, for locks, canals, and small navigable rivers.

To return to the subject of the Portsmouth Ship Canal, we feel much pleasure in adding that the undertaking receives the warm support of most nautical men, as their approbation must tend to its final

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model about a fortnight since (in Mr. Cundy's Office, 28, St. Clement's Lane) we took but a slight hasty sketch of it, without making any memoranda, and we are at this moment inclined to suspect that instead of the beam revolving upon the column as an axis, *the beam is fixed to the latter*, and the column is itself made to turn round with the rest of the machine. In either case, however, the principle is the same, though we submit that the former modification is entitled to a preference, as it appears to possess greater stability.]—Ed.

accomplishment. The distressing disasters that are occurring almost daily on our coasts while they make humanity shudder, points out the utility if not the necessity of this truly national work. The recent destruction of the Ogle Castle Indiaman, with all her passengers crew and cargo, is only one melancholy instance, among thousands of similar wrecks, that are incessantly taking place in this dangerous navigation; and it is well known that not only single ships, but whole fleets with thousands of lives have perished on the Goodwin Sands "at one fell swoop."

The advantages of the proposed canal as a means of conveying goods to and from Portsmouth will appear manifest, when we state that the money paid for the land carriage of goods by waggons to and from Portsmouth during the late war, amounted to no less than the annual sum of £265,750; which warrants the assertion made by a great naval officer, that the extra expences for land carriage paid by government alone during that period, would have been sufficient to cut a canal of sufficient magnitude and extent to navigate a frigate from London to Portsmouth.

WHITEHOUSE'S PATENT GAS TUBES.

This patent is for an improved method of making wrought-iron tubes for gas, and other purposes, the longitudinal seams of these being welded together by a process entirely new in the manufacture of iron.

The iron plates are selected of the proper thickness and length of the intended tube, and of a breadth equal to the circumference of the latter; the edges are then turned round so as to bring them together, and give the whole a cylindrical form. So far the process is the ordinary one, the novel improvement is as follows:

Adjoining to a blast furnace a strong drawing bench is fitted up, with a small spur wheel at each end fixed in a vertical position; round these wheels an endless chain is passed, stretching it (for the most part) in an horizontal direction; to this chain, motion is given by a winch fixed on the axis of that spur wheel which is the most distant from the fire. There is also fixed on to the bench very near to the furnace a strong screw press adapted to receive a top and bottom die forming, *when together*, a circular hole. The tube to be welded is made fast in a screw clamp which has a hook attached to it adapted to enter the links of the chain, it is then passed between the pair of dies (opened to receive it), and thrust into the furnace. Here it quickly acquires the welding heat, when the dies are screwed down to the proper bearing, the workman turns the winch which causes the chain to advance dragging the tube after it, which, as it emerges from the furnace receives severe compression between the dies, and the edges are firmly united. The end of the tube that was held by the clamp has now to be welded, it is therefore placed in the furnace while the other end is made fast to the clamp, and when the proper heat is attained, which requires but a few seconds, that end

of the tube is in like manner drawn through the dies, when the tube is completed.

Another mode adopted by the patentee in lieu of the dies, is to employ a pair of large tongs, the chaps of which when pressed together, correspond to, and are in effect, a pair of dies. These are held against a firm standard fixed in the draw-bench, and the tube is drawn through them instead of the fixed dies in the screw press, as before-mentioned.

By the usual process of making these tubes it is with difficulty and increased expence that they are rendered of a greater length than four feet: by the present new mode of welding, they may be conveniently made double that length, the iron is besides more perfectly united at the seam, and the surfaces and configuration of the tubes are more true and uniform.

ROBINSON'S PATENT PREPARED BARLEY AND GROATS.

As this patented preparation of vegetable matter has a very extensive sale, and being in reality a very convenient article of food, especially for children and invalids, we have thought it not amiss to give some account of the process, as detailed in the specification for the satisfaction of our readers.

The peculiar process adopted by the patentee (Mr. Matthias Robinson, of Red Lion Street, Holborn) and that on which the patent right is claimed, is said to consist in a mode of drying the grain under a regular temperature without roasting or parching it, so as to destroy its vegetating properties, and at the same time retain its nutritive qualities unimpaired; by which preparation the meal is brought into a state that will enable it to keep perfectly good for a long period of time.

The barley or groats is first completely cleansed from the husks, dust, and other impurities as usual by winnowing, and picking out all the extraneous matters. It is then evenly spread over the bottoms of sieves in layers about an inch and three quarters deep, and thus placed on ledges in a closet heated by steam; being kept therein, for three hours in a temperature of from 160 to 170 degrees Fah. the germinating principle of the grain is destroyed, and it is thoroughly dried, without being parched. The aqueous portion of the grain separated by evaporation, is conducted off by means of suitable pipes opening into the hot closet.

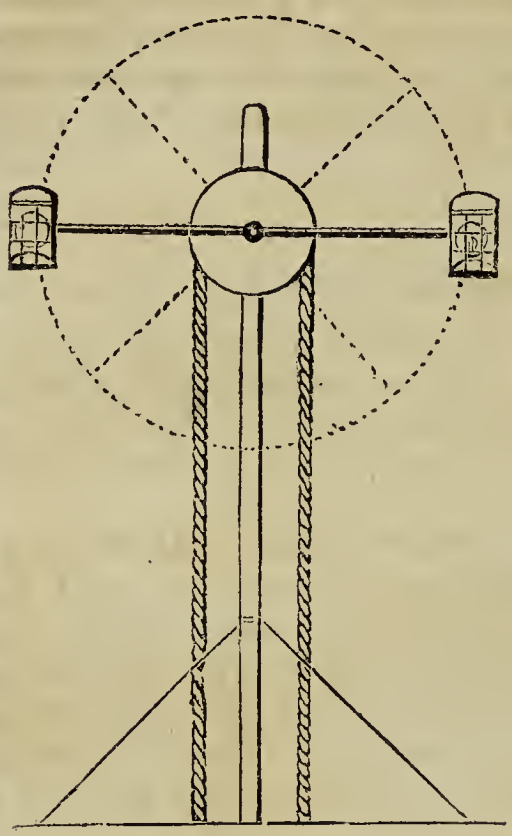
The drying being completed, and the grain cooled by exposure in shallow vessels to the air, it is ground by steel mills into flour, and the flour dressed by the ordinary bolting machinery; the cylinders of the latter should be made of wire gauze containing thirty-six wires to the inch. The meal thus prepared is divested of its raw taste; is wholly soluble in water, with which a smooth mucilage may be made in a tenth part of the time usually occupied in preparing food of the like description. So far this *patented* dried flour of barley and oats will be found of public convenience and utility.

MEANS OF PREVENTING STEAM BOATS FROM RUNNING FOUL OF EACH OTHER AT NIGHT.

"*To the Editor.*

"SIR,

"The late dreadful accident that happened to the Comet Steam Packet, and the one which more recently has befallen the Shamrock, renders it absolutely necessary that some measures should be adopted to prevent their occurring, if possible, in future. The following method appears to be equally simple and efficacious.



Let a stancheon or piece of wood, 10, 15, or 20 feet long, as may be thought proper, be stepped in the deck immediately over the axis of the paddle wheels; at the upper end a pulley revolves on a bolt fixed in the wood so that the pulley faces the stem of the vessel: on the forepart of the pulley fix a cross bar about 3 feet long: at each end of which fasten a lamp or lanthorn (shewing a brilliant light) by means of a pin at the back of the lamp going through a hole in the end of the bar: *if* the oil, &c. be not heavy enough to keep the lamp upright, lead must be added. A strap over the pulley and round the axis of the paddle wheels, will cause the lamps to revolve like the sails of a wind-mill, and if the lights are good may be seen at a considerable distance. The pulley and axis being of the same size, the lamps will perform their evolution at the same rate as the paddle wheels, so that any vessel approaching may estimate the rate of the steam vessels going by the velocity of the revolution of the lights. In dark or foggy weather bells may be added. The whole apparatus may be unshipped in the day time.

"I am, Sir,

"*Kingsland Crescent,*
"*Nov.* 17, 1825.

"Your most obedient Servant,
"JAMES DAY."

THE NEW PATENT ENDLESS LEVER ACTION.

"*To the Editor.*

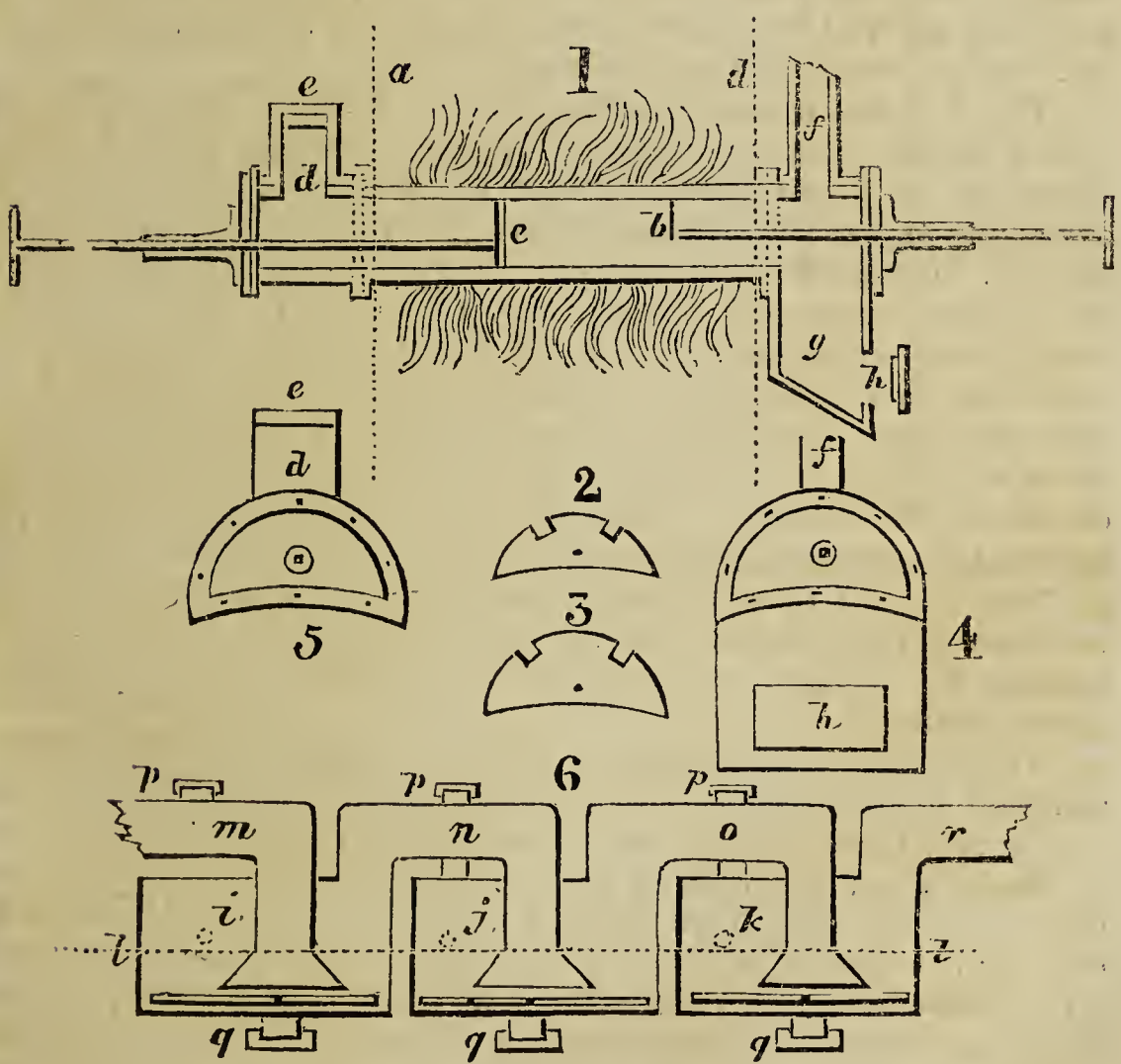
"SIR,

"IN your last number under this head I have to notice a communication, wherein is questioned the originality of my friend's improved system of gearing. From the general appearance of the two parts of which it is composed, being so familiar to the public eye, it has been compared to the *endless screw* of *White's* and *Sheldrake's*

systems of angled gearing. I wish it to be understood I do not claim those parts in their detached state, but the improved method of using them conjunctively, and the peculiar construction and application of the arbors in relation to the wheels, whereby I can reduce to practice more effectually, and embrace a greater number of mechanical advantages at the same time in this improved system, than has been before used in others for similar purposes. Those systems above referred to, are of course, still open to the public use, and as I do not interfere with the rights of any individual, I do not consider myself justified on this occasion intruding further on your valuable pages, by analysing these systems in comparison with the improved one in question, but at a proper time and place I am prepared to prove that it cannot be identified with either of them.

"I am, Sir,

"10, *High Holborn*, "Your obedient Servant,
"15*th Nov.* 1825. "W. BURNETT."



HOBBINS'S PATENT APPARATUS FOR OBTAINING AND PURIFYING GAS FROM COAL.

The above diagrams are illustrative of some apparently valuable improvements in the distillation of coal gas, invented by Mr. Hobbins, an ironmonger, of Walsall, in Staffordshire, and for which a patent

was recently obtained. They represent a new construction of retorts for the generation of the gas, and an improved apparatus for its subsequent purification. The advantages expected to result from these arrangements are, first, an increased facility in charging the retorts with coal, and afterwards in discharging them of the coke resulting from the separation of the gas, thereby considerably reducing the labour of the stoker or attendant of the fire. Second, in affording a simple and ready means of spreading the coal over the retort in an uniform thin stratum, thereby equalizing the temperature of the coal throughout, rendering the luting of the joints unnecessary, and causing a speedy separation of the gaseous products; the whole operation taking but ten minutes. The purifying vessels adopted by the patentee are of two different constructions, but both are in principle somewhat similar to a Woolfe's Distillatory Apparatus; in them the gas is made to pass successively through several vessels, filtering in its passage from one to the other, and the chemical action which takes place from the contact of the gas, with the lime or other purifying materials produces a constant agitation without the necessity of resorting as usual to mechanical aid.

Fig. 1 shews a longitudinal section of a retort, supposed to be placed in the furnace, occupying the space between the two dotted lines *a a;* the two ends of the retort are flanged on to the body, and projecting beyond the brickwork, are removed from the influence of the fire. *b* and *c* are two scrapers, with long rods attached to them which pass through the flanged ends of the retort, and have cross handles at their extremities; as the scrapers have to be pushed the whole length of the retort, the rods should be about a foot longer than the latter, but as this proportional length could not be shewn in an engraving upon the above scale, they are exhibited as broken off near to the handles. The form of the scraper *b* is shewn by the separate figure 2, and the form of *c* by the separate figure 3; in each of them are two square notches, which sliding upon square bars of iron placed longitudinally on the upper side of the interior of the retorts, are thereby suspended to it, and kept uniformly in their proper positions.

The process of working the retort is as follows:—Previous to charging it, the scraper *c* is drawn outwards from the body of the retort close up to the end, and the scraper *b* is pushed inwards so as to come in contact with *c;* both scrapers being then beyond the opening *d,* the charge of coals is admitted through the latter by opening the cover *e,* which may turn upon a hinge joint, or be lifted up by means of a pulley and counter weight. The scraper *c* is then drawn back from its recent situation (beyond *d*) which spreads the coals out in an even layer, all over the bottom of that part of the retort exposed to the action of the fire. About a foot from each scraper the rods are connected by a solid and hollow screw, so that when the rods are drawn out they may be removed out of the way by unscrewing them at those parts. As the distillation of the coal proceeds the gas escapes by the tube *f,* and from thence to the purifying vessels. When all the gas has been separated from one

charge of coals, the scraper *c* is thrust forward, pushing before it and clearing out all the coke, which falls into the coke-box *g*, previously closed by the mouth-piece *h*; from this receptacle the coke may be afterwards let to fall into a barrow and be wheeled away.

As it is necessary that the apertures for the admission of the coal and the discharge of the coke should be closed air-tight; the patentee has availed himself of the distant or screened situation of these parts from the heat of the furnace, to adopt a lining of lead to the covers, by which means they are closed as effectually as by the troublesome process of luting the joints at every charge. To recharge the retort both the scrapers are again thrust back beyond the opening *d*, when a similar quantity of coals is admitted, which are spread out again in an even layer by drawing back the scraper *b*, and the distillation recommences. The process is in this manner repeated as long as the production of gas may be required.

It should be noticed that the ends of the retorts are connected to the body by flanges screwed together, so that when the furnace has destroyed the latter a new one may be screwed on to the ends of the old retort at a comparatively little cost, instead of having them wholly new. From each end of the retort a tube projects horizontally about ten inches long, and one inch in the bore, which serves both as a support and as a guide for the scraper rod which slides through it.

Fig. 4 gives an external view of that end of the retort where the coke is discharged, and *fig.* 5 a similar view of the other end of the same where the coals are received: the letters have reference to the like parts in each of the figures.

As mentioned in the preceding part of this article, the purifying vessels proposed by the patentee are of two descriptions; we have selected that for our engraving which we consider to be the best, and shall give some account of the other before we conclude.

Fig. 6 gives a vertical section of a series of three vessels, *i j k*, the lower parts of which up to the dotted line *l l*, are occupied with a stratum of lime, or other purifying material. The impure gas from the retort is first received into the tube *m*, and by its pressure descending along the bent arm, it passes out of the expanded or bell-mouthed end where it mixes with the lime in the vessel *i*, and deposits therein much of its impurity by condensation; from this vessel the gas again rises and enters the tube *n*, from thence filtering through the lime in the vessel *j* it re-ascends and enters the tube *o* into the third filtering vessel *k*. The pressure upon the gas being constant, the filtration may be repeated through any number of these vessels, but the extent of the process already described will, in general, be sufficient to produce illuminative gas of great purity; in which case it would be conducted by the tube *r* to the gas-holder for subsequent distribution.

The three covered tubes *p p p*, above the filtering vessels are for the purpose of charging them with the lime; the dotted circles are perforations in the sides of the vessels (furnished with plugs) for ascertaining the depth of the stratum of lime, &c.; and the three tubes *q q q* at the bottoms of the vessels are for discharging the lime

when saturated with the various matters that have been condensed during the process of filtration. To aid the complete discharge or clearing of these vessels of their contents, three bars of iron are employed as scrapers, one in each vessel, and nearly of the same length; a rod, as a handle, is screwed into each which passes through a hole (provided with a stuffing box) in the side of each vessel.

The other form of purifying vessels proposed by the patentee will, perhaps, be understood by the following description. A large cylindrical basin is divided internally by a series of circular partitions placed concentrically; on the bottom of the whole the stratum of lime or other matter is laid. Over these partitions are placed in an inverted position, a number of circular vessels one within another, and arranged alternately between the partitions, with their edges imbedded in the layer of lime. The gas, which enters by a tube through the centre of the bottom of the large exterior vessel, first ascends over the innermost partition, and thence descending by the interposition of the bottom of the innermost inverted vessel, it is compelled to enter the first portion of the stratum of lime; having filtrated through this, it passes up between the outside of the inverted vessel and the next partition; passing over this it descends on the other side of the last-mentioned, and enters a fresh portion of lime; and so on, from compartment to compartment, until the purification of the gas is completed, when it is conducted into the gas-holder ready for the purposes of illumination.

BARLOW'S PATENT PROCESS FOR BLEACHING AND CLARIFYING SUGAR.

This process consists simply in the employment of molasses as a bleaching material, instead of a solution of clay in general use for that purpose.

Our readers are no doubt aware, that the molasses sent to us from the West Indies, are those portions of the syrup which runs from the brown or Muscovado sugar, during the process of crystallization. These molasses consist of sugar in solution, with a portion of mucilage and other matters, and they are employed in this country in making a kind of sugar, termed in the trade, "bastard sugar." To prepare this article, the syrup (or molasses) is concentrated by boiling in large vessels, then poured into earthen pots of a conical form, where it is suffered to remain two or three days. The conical pots are then opened at the apex, or lower end, from whence a quantity of molasses runs out which has drained from the crystallized mass above, in this state called "bastard sugar." A stratum of clay, diluted with water to the consistency of thick paste, is now spread over the tops of the pots, and the water gradually oosing from the clay through the sugar carries with it the colouring matter along with a portion of the syrup, which it dilutes, in its progress. By this process the sugar is rendered much whiter and purer; but there is a loss of syrup sustained by the maker, which Mr. Barlow proposes to remedy by employing, for the clarifying and bleaching material, West Indian molasses only.

The crystallized "bastard sugar" already in the mould, is therefore to have, instead of the diluted clay, a quantity of molasses poured over it, which will pass through the moulds or pots in the space of a few hours, bleaching and clarifying it considerably, without diminishing the quantity of sugar previously crystallized.

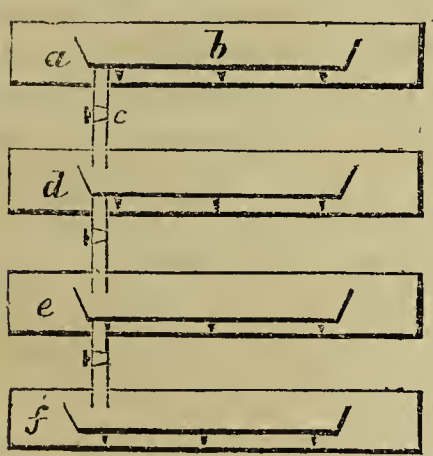
NEW PROCESS FOR RECTIFYING SPIRIT.

"*To the Editor.*

"SIR,

"THE alkaline salts have been, I believe, employed for the rectification of spirit, as long since as the time of the learned Boerhaave, and has been adopted by all succeeding chemists, and by distillers, as the only means of obtaining absolute alcohol. A most important improvement upon this mode of rectification, without heat, it is said, has recently been made by a French chemist.

"The process I am told consists in placing a quantity of dry muriate of lime, or other deliquescent salt in a large shallow covered vessel; in this is placed another vessel of smaller dimensions, and resting on the bottom upon short legs, containing the diluted spirit (brandy, for instance) to be concentrated; the outer or larger vessel is then covered down and properly luted, to prevent the escape of the spirit. A series of similar double vessels are then arranged underneath the former charged with the muriate of lime only, and pipes of communication lead from one to the other, are furnished with stop cocks. Those arrangements as well as the process will be perfectly understood upon reference to the annexed diagram.



"*a* is the first vessel containing the deliquescent salt, *b* that containing the dilute spirit. The cover of *a* being well closed and luted, it is left for several days for the salt to attract the water from the spirit; and when the former is supposed to be fully saturated with the aqueous particles, the spirit in *b* (considerably improved in strength) is drawn off into *d*, by turning the cock *c*. This second vessel being also provided with a stratum of muriate of lime, the process of concentration recommences, by a further abstraction of the water contained in the spirit. In like manner the spirit may be successively operated upon by the salts contained in the vessels *e* and *f*, and if required by any additional number of vessels, until alcohol of the greatest purity is obtained.

"As each vessel is successively emptied of the spirit, the saturated salt is taken away, and replaced with a fresh quantity of the dry salt, when it is ready to operate upon another portion of spirit let on from above.

"*Paris,* "W. W——N."

"*Nov.* 21, 1825.

[The process of rectification above described by our obliging correspondent is undoubtedly a very elegant and convenient one, but we suspect the economy of heat cannot be great, as the heat of a stove will be necessary to drive off the water in the deliquescent salt, to render it again fit for use.] Ed.

CROSSLEY'S PATENT LAMPS OR LANTERNS.

The object of this invention, is the construction of a street or ship lamp, the light in which shall not be liable to be extinguished by a sudden gust of wind. It is, therefore, so contrived, that the passages for the ingress of the air, and the egress of the smoke are made in a zig-zag direction, thereby preserving a perfect draft throughout, yet preventing the inconvenient effects of tempestuous weather.

MISCELLANEOUS INVENTIONS,
Discoveries, & Processes in the Useful Arts.

Eve's Steam-Engine.—This invention is said by the Liverpool Courier to consist of "but two moving parts, both of which revolve, and are similar to each other, and a steam generator. It has no parts in common with the steam engines in use. No cylinder, piston, valve, cock, fly-wheel, crank, condensor, or any reciprocating parts whatever. It is impelled by the direct impulse of the steam acting on surfaces at right-angles with the motion, so as to appropriate its whole power under the most favourable circumstances. There is the least possible friction, as there are no parts that rub or touch but the pivots. Its velocity is unlimited, so that with the smallest conceivable force acting, the greatest power required can be obtained, by which means an engine of a very small size may be made to perform almost any given quantity of work."—!!—?

Wadsworth's Steam Generators.—"We understand (says the New England Palladium of the 25th October) that Wadsworth, of Portsmouth, (U. S.) has discovered a valuable improvement in the generation of steam, and the application of the power. The principle on which the plan is founded, is to generate steam from frequent injections of water, without cooling, or lessening in any degree by those injections the supply of steam already generated.

Model of England.—"About five years ago," Mr. Tredgold says (in his recent work on rail roads), "a model of England, in wood, was began by a much lamented brother, who died in 1822. It was to have been in separate squares, with the scale of elevations five times the scale of the plan; one of these squares is partly carved, and an immense quantity of information regarding sections, heights, levels, soundings, charts, &c. is collected. The principle intended to be acted upon, was that of carving each river, with its

subordinate streams, as accurately as possible, and then proceeding to complete the valleys and ridges. It was an immense undertaking for one individual to conceive and set about; but ardent enthusiasm vanquishes difficulties: his knew no bounds; and, perhaps, it was his over-anxious pursuit of these inquiries which undermined his constitution."

The Patent Anti-Attrition.—This very excellent composition for reducing the friction of the axle-trees of carriages, and of the rubbing parts of all descriptions of machinery, is simply a mixture of hogs lard with plumbago (or as it is erroneously termed, "black lead") in the proportion of four parts of the former to one of the latter.

To make Bronze.—Melt 14lbs. of pure copper, afterwards add 6lbs. of zinc, and 4lbs. of tin. When these are combined it forms the metal so much used for medals, busts, and statues.

Ultramarine.—The mode of preparing this beautiful pigment, is to make the stones, called lapis lazuli, red-hot, and throw them into water, when they may be easily pulverized. It is then reduced to a fine powder in a mortar, and intimately combined with a varnish composed of resin, wax, and linseed oil. It is then of the consistence of paste, and is put into a linen cloth and repeatedly kneaded with hot water. The first water is thrown away, the second gives a blue tint of the first quality, and the third yields one of less value. This process is founded on the property of the earthy matter of the stone adhering more firmly to the stone than the colouring matter, the latter is therefore separated by washing away.

Gold Trinkets.—Dr. M'Cullock has pointed out a superior method of cleaning and improving the surface of gold trinkets; he directs the trinkets to be boiled in water of ammonia, which dissolves the metallic copper of the alloy to a certain depth, and leaves a surface of pure gold.

Porter.—Before the year 1730, the malt liquors in general use in London were ale, beer, and a drink named two-penny. It was then customary to call for a pint or tankard of half and half; i.e. half of ale and half of beer; or half of ale and half of two-penny. In course of time it also became the practice to call for a pint or tankard of three-threads, meaning a third of each ale, beer, and two-penny; and thus the publican had the trouble to go to three casks and turn three cocks for a pint of liquor. To avoid this inconvenience and waste, a brewer of the name of Harwood conceived the idea of making a liquid, which should partake of the united flavours of ale, beer, and two-penny; he did so, and succeeded, calling it *entire*, or *entire butt*, meaning that it was drawn entirely from one cask or butt, and as it was a very hearty and nourishing liquor, and supposed to be very suitable for porters, and other working people, it obtained the name of *porter*.

The Dog originally an inhabitant of the new world.—M. Moreau de Jonnes, in the An. de Sciences Mat. for May, 1825, maintains, from relations of the European mariners who first visited America and the West India Islands, that they then contained a native race of dogs which did not bark, and were without hair; and he adds that this original race is still met with in some parts of America.

LETTERS OF ENQUIRY.

PRINTERS' INK.—"Allow me through the medium of your valuable publication to enquire if you, or any of your readers, can by some chemical means destroy the impression ink without damaging the paper or taking away its whiteness. By answering this, or if not, by making the enquiry of your readers,

"*Bond Street,* "You will oblige,
"*Nov. 7th,* 1825. "Your most humble Servant, V. C."

MIRRORS.—"The method used in silvering looking glasses and reflectors is in general well known; but the foliating glass with lead, or leading glass, for looking glasses and reflectors, is not so publickly known. Therefore if some of your ingenious friends and correspondents will be so kind as to explain the method of foliating with lead, or leading glass for looking glasses, reflectors, concave and convex mirrors, &c. instead of silvering them with tin-foil and quicksilver, it will much oblige many of your readers and correspondents, as well as "Your obedient Servant, I. W. B."

[In the absence of better information we recommend our correspondent to try the effect of the following.—Dissolve in a ladle, one part of lead, with one part of tin. When melted, add one part of bismuth; skim off the dross; take the ladle from the fire, and before it sets add two parts of quicksilver; stir the whole together, being careful not to inhale the vapour, as it is very pernicious. Let the glass be clean and warm, preparatory to pouring on the mixture, which will quickly adhere.]—ED.

TO OUR READERS AND CORRESPONDENTS.

The List of New Patents usually inserted is postponed to our next number for want of room.

The description of the Patent Gas Valves intended for the present number is also deferred until our next, when we purpose adding an account of the ingenious arrangements made at the Portable Gas-works for compressing the gas and filling the reservoirs of the lamps.

We will endeavour to furnish J. M***s with the information he seeks at the earliest opportunity.

We have received Mr. B. WILLS's favour, and while we ardently wish the utmost success to the good cause which he has espoused, we cannot but regret that the subject of his enclosure, in its present form, is inadmissible in our work.

We thank our correspondent P. O. of Dublin, for his hearty recommendation of our work to the New Society.

T——s T——R's favour is reserved for a future number.

W. S. observations on railways is received.

We entirely agree with V. C. in his observations upon the design for a smoke consuming stove sent to us by "No Philosopher." The subject was not intended by us for insertion, but was sent by mistake to the Printer.

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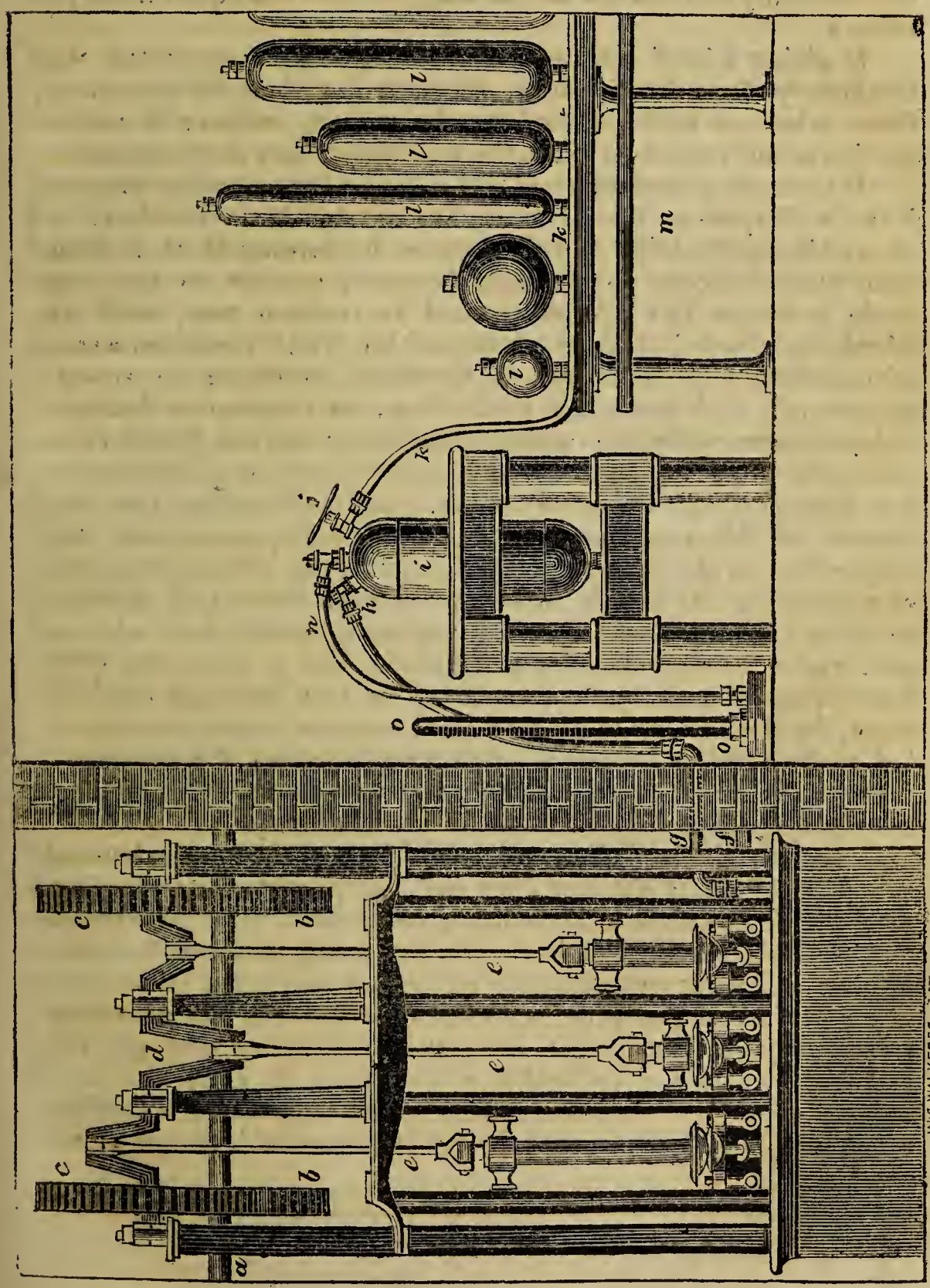
CONTENTS:

Portable Gas Works - - - - - 161
Smoke Consuming Bugle Stove - - 168
Expanding Metallic Pistons - - - ib.
Wilson's Process for Making Artificial Stone Chimney-Pieces - - - - 171
Steart's Process in Manufacturing the Lino-Stereo Tablets - - - - - 172
Nesbitt's Patent Moss Paper - - - 174
MISCELLANEOUS—New Mechanical Power, 174—Weaving, 175—To make Bleaching Liquid, ib—To Tin Iron and Copper Vessels, ib.—Letters of Enquiry—Ironing Linen, ib.—Improved Barometers, ib.—Patents, Correspondence, &c. 176.



The Process employed at the Portable Gas Works for compressing the Gas in the Portable Lamps.

PORTABLE GAS WORKS.

Nothing more strongly marks the rapid progress of scientific discovery during the last century, than the employment of gas for the lighting of our streets and houses. That a thin invisible fluid, clear as the air we breathe, should contain combustible matter capable of affording, upon ignition, a transcendantly beautiful and permanent light, we doubt not will continue to excite the admiration of every beholder for ages yet to come; and the introduction of it will assuredly be regarded as the most brilliant era in the history of science.

In giving a brief outline of the principal facts connected with the history of gas illuminations, we trust we shall be excused by those who are well-informed on the subject, as there is another portion of our readers to whom the information may prove acceptable.

It is nearly a hundred years ago since coal gas was first proposed by a Dr. Clayton for illumination; he collected it in bladders, and shewed its applicability to this purpose by burning it as it issued from their orifices; no attempt, however, appears to have been made to render this light subservient to common uses, until Mr. Murdoch, about sixty years afterwards (in 1792), instituted a series of experiments at Redruth, in Cornwall, in which he ardently persevered; and succeeded so far then, as to prove its feasibility before numerous friends; which subsequently led (in 1798) to his constructing an apparatus at the Soho Foundery, near Birmingham, for lighting those extensive works. Notwithstanding the entire success of this experiment on the large scale, seven more years elapsed before the example was followed by any other establishment of magnitude. At length, in 1805, the large cotton mill, belonging to Messrs. Phillips and Lee, of Manchester, was lighted with coal gas, under the direction of Mr. Murdoch, and a statement of the vast saving effected by the proprietors of that immense establishment, by the burning of gas instead of candles, being made public, led to its adoption in several other manufactories; it was gradually introduced into London and our great towns, and it is now being successively adopted by all the chief cities in Europe.

The gas obtained from oil has of late years been extensively substituted for that obtained from coal, on account of its affording a much richer and more brilliant light, unattended with the nauseous and suffocating smell of coal gas, and being entirely free from sulphur and other contaminating matters, a preference is uniformly given to it where the little increase of expense is not an object; from its superior purity the substitution of it for coal gas is of essential importance to health when burned in close rooms. It has no effect upon metallic goods, gilded pictures, and furniture, which are materially injured by the sulphuretted hydrogen of coal gas.*

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* See Register of Arts, No. 1—p. 2.

As most of the writers on the comparative advantages of oil and coal gas have been more or less interested by their connection with oil or coal gas establishments, we cannot perhaps do better than quote the impartial observations of the justly celebrated Dr. Ure on the subject; at page 603 of his Chemical Dictionary he states:

"The economy of oil gas may be judged of from the following table:—

Argand burner oil gas, per hour....	¾.
Argand lamps, spermaceti oil.....	3d.
Mould candles.....	3½d.
Wax candles	14d.

"The oil gas has a material advantage over coal gas, from its peculiar richness in olefiant gas,* which renders so small a volume necessary, that one cubic foot of oil gas will be found to go as far as four of coal gas. This circumstance is of great importance, as it reduces in the same proportion the size of the gasometers which are necessary to contain it; this is not only a great saving of expense in the construction, but is a material convenience where room is limited."

In a recent number of our work (57) we gave a description of Messrs. Taylor and Martineau's recently patented improved oil gas apparatus, together with an account of the process of generating the carburetted hydrogen for illumination; we therefore now proceed to the modes by which the gas so generated is conducted to our houses and apartments. One of these, that by means of laying down main and branch pipes of communication is so well known as to need no description; the other more novel and interesting mode, that of compressing a large volume into a small vessel, so as to render it as portable as a common lamp or candle, it is our present business to describe.

To obtain the requisite information ourselves, we visited the London Portable Gas-works, in Little Sutton-street, where we were kindly permitted, by the liberality and politeness of the managers, to take some sketches, and witness the highly interesting operations. In the diagram which precedes this article, we have placed some parts of the apparatus which it embraces nearer together, and in situations somewhat different, to their relative positions at the works, in order that the operations of compressing the gas and filling the lamps might be seen at one view.

In the *Portable* Gas-works, as in all others, the gas as it is generated and purified, is conducted to, and kept in, those large vessels called gasometers, or rather gas-holders; so far the operations in most gas-works do not materially differ, bnt here the similarity ends; for the gas instead of being distributed from thence through pipes in its natural volume under simple atmospheric pres-

* Olefiant gas is composed of one prime of carbon and one of hydrogen, to which Dr. Ure gave the name of *carburetted hydrogen*, to distinguish it from the gas resulting from one prime of carbon and two of hydrogen, which he terms *sub-carburetted hydrogen.*

sure, is conducted from the gas-holder to the chambers of a set of force pumps, by which it is gradually compressed into a thirtieth part of its previous bulk. The manner of effecting this we will now explain.

a is the main horizontal shaft of a steam engine, upon which are fixed two spur wheels *b b*; the teeth of these take into the teeth of two similar wheels, *c c*, fixed in the axis of a three throw crank, to which is thereby communicated a rotary motion. The crank in its revolution (in the usual manner) gives an alternating motion up and down to the three rods *e e e*, which work three force pumps. (The construction of these pumps, which is very peculiar and ingenious, cannot be shewn in the present engraving, we shall therefore reserve a description of them to a future number; merely observing, that they were invented by Mr. D. Gordon, the patentee of the Portable Gas Lamps, about four years ago, and have been found extremely efficient in compressing the very subtle fluid they have to operate upon.) As the plunger of each pump is successively raised, a quantity of gas equal to the space previously occupied by it flows from the gas-holder into the chamber at the opposite end, by means of a pipe of communication, part of which is brought into view at *f*. The valve by which the gas enters opens *inward*, so that it cannot return the way it came; but there is another valve which opens *outward*, and this is kept closed by a spring of sufficient power to prevent the escape of the gas in the uncompressed state; upon the descent of the plunger the strength of this spring is overcome, the gas is forced out, and the valve closes again. From the pumps the gas proceeds along the tube *g*, and enters by the jointed valve *h* into a strong wrought-iron recipient, *i*; in this vessel it is evident the gas might be collected and condensed to any required number of atmospheres; but the valve *j* being opened (by the cross-handled key shewn) it is suffered to flow through the pipe *k k*, which is extended along the upper side of the "filling table" *m*, and from thence into the reservoirs ("portable lamps"), *l l l l l*, by which arrangement the pressure of the gas becomes equalized in all the vessels, however great their number. In this manner 30 or 40 lamps are filled at a time; but as the limits of our diagram are necessarily contracted, and as a more extended view would be useless, but five lamps are shewn; and these are drawn of various sizes and shapes, to shew the form and description of vessels used, to such of our country readers who may not yet have seen, or experienced the advantages, of this very charming contrivance.

In a Portable Gas establishment there are several of these "filling tables" similar to the part of one shewn at *m*; to each of them is fixed a conducting tube like that at *k k*, running the whole length; at regular distances along these tubes are perforations furnished with strong well-screwed nozzles, all of which fit easily, yet with the nicest precision, to the bottom valves of the lamps in the manner shewn.

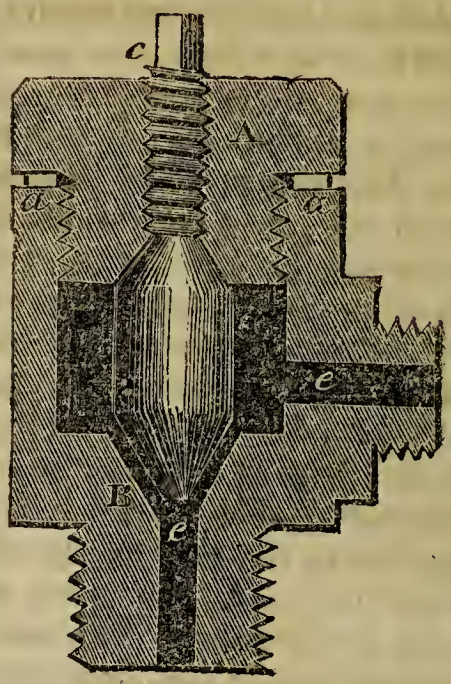
The pumps which we saw at work together were six in number, and as every descent of the plungers compresses a quantity of gas

uniformly into every lamp, they become gradually yet rapidly filled. The degree of condensation at which the gas has arrived by the continual action of the pumps, is accurately denoted at all times throughout the process by means of a mercurial guage, applied in the following manner. The pipe *n*, which proceeds from the recipient *i*, conveys the gas under compression into the reservoir of mercury at the bottom of the guage *o o*; the pressure of the gas upon the surface of the mercury causes the latter to rise up a long glass tube, which has a scale affixed to it accurately graduated, shewing clearly the degree of pressure or condensation in the lamps. The workman who attends to the process of filling a set of lamps watches the rising of the mercury in the glass tubes, and when it arrives at the line denoting 30 atmospheres, the valve *j* is shut by means of the cross handle. All the lamps attached to the pipe in connexion with the valve closed being now filled, are taken away, by unscrewing them from the sockets in the tube. The external pressure being removed by the turning off of the gas, the lower valves of the lamps close by the pressure of the gas within them, and the contents are further secured from escaping by the workmen screwing a cap over the lower valve, as he successively removes each of them from the tube. To ascertain whether there is any leakage, the lamps are now taken by another workman, one by one, and immersed in a contiguous trough of water, where, if any leakage exists, it is immediately shewn by the gas bubbling up; which however did not happen to one whilst we were present, on account of the superior quality of the workmanship of the valves and other parts. The perfect state of each lamp being thus ascertained, they are placed and arranged on extensive racks or stands, ready to be taken out to their destination by the company's carts, which are regularly dispatched to all parts of the town.

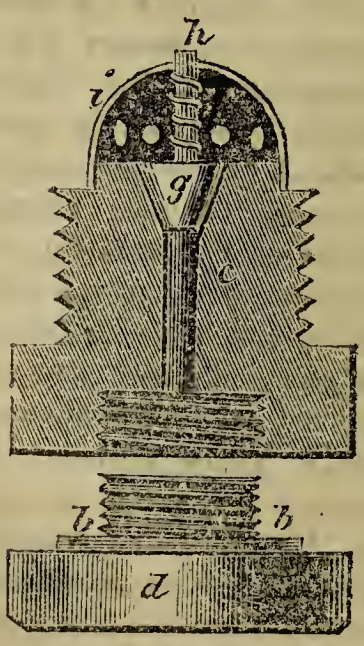
In the preceding account we have omitted to mention two circumstances, which ought not to be passed over unnoticed, which are as follow: The tube *g*, which conducts the gas from the pump-house to the recipient, *i*, is immersed in water by passing along a trough filled with that fluid, by which, if any leakage should take place in this supply pipe, it may be immediately detected. Instead of only one mercurial guage, which any defect might cause to give wrong indications, there are usually three employed together; each of these have a separate tube communicating with the vessel *i*, so that if the action of one of them should prove defective, it is immediately discovered by its disagreement with the others.

To complete our subject, it now becomes necessary to describe the *construction* of those valves, of the *uses* of which we have only yet spoken. They are of three distinct kinds, having each their peculiar and separate uses, and were the subject of a patent lately granted to the inventor, Mr. David Gordon.

The annexed engraving gives a sectional view of an improved stop valve (similar to those shewn in the frontispiece attached to the principal recipient, *i*), and especially adapted for transferring the compressed gas from one vessel to another, without occasioning loss

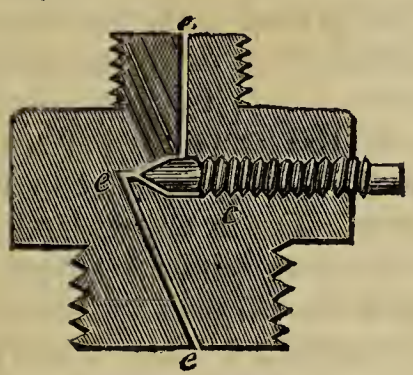


during the process. It is composed of two pieces of metal, A and B, which are screwed together with a soft metal collar between them, at *a a*; *e e* represents the openings through which the gas is allowed to pass. The piece A has the regulating steel screw *c* tapped through it, being formed at the lower part with a double cone, one part of which cone is adapted to fit correctly into the cavity in the under side of the piece A. Now when the lower cone of the regulating steel screw is screwed or forced tight down into the conical seat in the piece B, it prevents all escape of the gas; and when it is desired to transfer compressed gas from one lamp or reservoir to another, the regulating screw *c*, is to be turned until its upper cone fits and applies correctly into the conical cavity in the piece A, and thereby prevents all escape of the gas up the threads of the regulating screw during the process of transferring, allowing at the same time free passage of the gas from one reservoir to another through the openings *e e*.



The above figure is a sectional representation of the improved valve, which is fixed at the bottom of each reservoir or lamp, for the

purpose of filling them in the manner described in the preceding part of our subject. This filling valve consists of a small conical plug, *g*, which is fitted into a conical cavity or seat in the piece of metal, *c*, similar to the valves of an air gun, being closed by a slight steel spring, *h*, and guided in its way by a metal pin, which slides through a hole in a small brass cap or perforated cover, *i*, represented as screwed over it; *d* shews a brass plug, which is intended to be screwed into the lower aperture of the piece *c*, after the filling is completed. The upper surface of this screw plug is furnished with a soft metal ring or collar, *b b* (as in the before-mentioned valve), which being pressed by the force of the screw into close contact with the under side of the piece *c*, effectually prevents any escape of the gas from that end of the reservoir, even if the filling value, *g*, should not be quite air-tight.



The above figure exhibits a section of an improved construction of a regulating valve, adapted to permit the flow of the gas to the burner being adjusted with great nicety and precision. The passages for the gas, *e e*, are drilled out of one solid piece of metal, and the regulating screw, *c*, is tapped into the side of the same piece; the lower part of it is adapted to screw into an aperture at one end of the reservoir of the lamp; when the regulating steel screw, *c*, is screwed up, so that its conical end fits tightly into the conical cavity, it closes it perfectly, and prevents all escape of gas to the burner, *a*; but on turning the regulating screw slighty round by its square head, the gas escapes through the passages *e e*, to the burner, in any degree that may be desired, Previously to inserting the regulating screw, it is dipped into a mixture of bees wax and oil, which fills up every minute cavity or space that may be left between the threads of the two screws.

The soft metal rings or collars (before-mentioned) are firmly fixed by soldering or otherwise, to one of the surfaces which form the joint; they are not therefore in danger of being displaced or injured by screwing them up hard, but produce a very tight and sound joint.

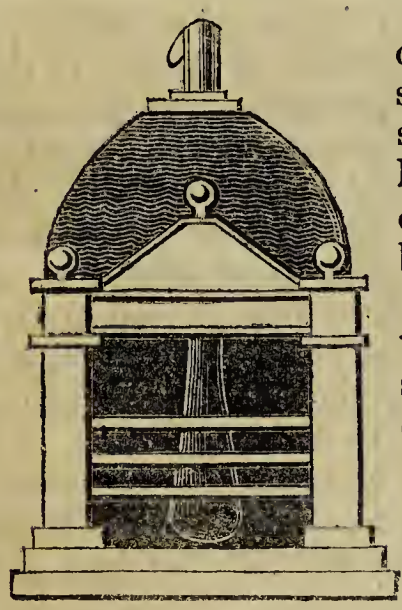
All the valves and joints appear to be executed in the best style of workmanship, which approximates as nearly as possible to mathematical truth and exactness: the reservoirs are all regularly proved to be capable of sustaining several hundred pounds per square inch greater pressure than they are ever afterwards subjected to; and the most judicious arrangements are made to prevent the possibility of any inconvenience resulting from the use of them.

THE SMOKE-CONSUMING BUGLE STOVE.

"*To the Editor.*

"SIR,

"WITH respect to the drawing of a stove (which from its use and shape I shall denominate The Smoke-consuming Bugle Stove) sent to you by a person subscribing himself 'No Philosopher,' and of which a design is given in the 56th number, vol. 3rd. of the Register of the Arts and Sciences, I would wish to know if the contriver has considered what is to consume the smoke first generated on lighting the fire; and supposing a remedy to be found by which this objection should be obviated, such as putting into the stove at first live cinders or charcoal, I would wish to be informed if such a fire can be kept properly alive without an aperture so as to admit of a current of air to pass from the room through the fire to the exterior atmosphere, and, if so, whether the room would not be filled with a vapour and effluvia from the coal (even should the smoke be consumed according to the projector's plan) too noxious to be endured. Allow me, then, to suggest what I consider to be an improvement, and, if it succeed, of such a magnitude, as to make it an article of use, particularly in rooms where a *great length of pipe* would be required in a stove upon the old plan to carry off the smoke, to prevent its being a nuisance to the other parts of the house or neighbourhood.



"I would then advise that the small end of the pipe which terminates (in your correspondent's plan) near the surface of the fire, should be carried up through the bend of the large part of the tube immediately into the open air, for the purpose of keeping up a brisk fire, and of carrying to the *nearest point* (which could not be done with smoke) any vapour arising from the coal, which may be seriously felt in a *close room*, but not in the open air as when accompanied with smoke.

"The heat of the pipe that passes through the fire will consume the smoke passing within it there is not a doubt; but will that heat (which will considerably add to that of the room with less fuel than common) fuse the metal of which the pipe is made?

"I am, Sir,

"A MEMBER OF THE BATH MECHANICS' SOCIETY."

"*Bath, Nov. 26th,* 1825."

EXPANDING METALLIC PISTONS.

"*To the Editor.*

"SIR,

"I KNOW not whether it will be consistent with the plan of your Work, but it would be obliging not only myself but several of your subscribers in this city, were you to give a description

of the several kinds of metallic pistons (or "metallic stuffing," as I believe it is called), used in steam engines and pumps. These inventions are indeed of a nature so highly interesting and curious, that I doubt not the introduction of some account of them will be deemed by the generality of your readers as a valuable improvement to your work, already pre-eminent in practical mechanical inventions.

"*Norwich,* "Your's, &c.

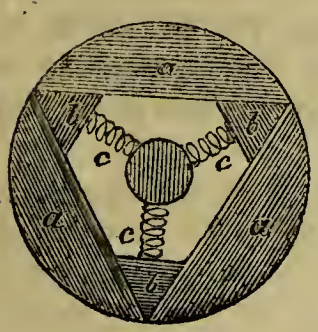
"4*th December,* 1825. "RICHARD WINTER."

It always affords us real pleasure to oblige a correspondent when it can be done with satisfaction to the majority of our readers. In the present instance the subject proposed to us is one of great importance; and one in which a vast deal of mechanical talent has been very successfully exercised: we are indeed at a loss to know how it has happened, that inventions possessing so much real ingenuity as the metallic pistons, have not found their way into our work before now.

It is obviously necessary that the piston of a steam engine should be rendered steam-tight at the least expence of friction; and it is well known that the ordinary packing of a piston by means of hemp and tallow produces so much friction as to reduce materially the power of an engine. Besides this, the common packing soon wears out, especially in high pressure engines, requiring very frequent renewals; therefore the construction of a metal piston, capable of expanding in a true circle so as to press uniformly and closely to the sides of the working cylinder, may fairly be regarded as a desideratum in mechanics.

We have selected for our present number two of the most improved forms of metallic stuffing, and shall endeavour to add the description of some others in an early subsequent number.

The first that we have to present to the notice of our readers is the patented invention of Mr. John Barton, of Seward Street, Goswell Street. The drawing from which the engraving was taken we regret to notice is very unworthy of the subject, for we cannot help characterizing the invention as one that evinces profound mechanical talent.



The annexed figure gives a horizontal section of Mr. Barton's piston. It is composed of three segments *a a a*, forming together a circle, they are made either of brass, or cast steel, hardened and tempered. These segments are preserved in their places by three triangular metal wedges *b b b*, which act equally upon them by the pressure of three strong helical springs *c c c* working over three steel pins (not shewn). When the segments become worn, the wedges are protruded forward by the force of the springs, and fill up the space they would otherwise leave unoccupied; by which a perfectly close contact is uniformly preserved for a very considerable period of time.

On the exterior or periphery of the circle formed by the segments and wedges, three grooves are made all round; the upper and lower

are to contain two metal rings with a cleft across each, which just fit flush into them; these serve to keep the several parts together, so as to prevent any displacement in putting in or taking out the piston from the cylinder. The middle groove is for the purpose of holding grease or oil to lubicrate the piston and cylinder.

The several parts are formed and fitted together with mathematical exactness. It is easy to conceive that these pistons must fit closer and more accurately to the cylinder after they have been some time in use, as the surfaces in contact become highly polished. Their action, it is said, was found so perfect by Messrs. Bramah, of Pimlico, as to resist the pressure of twenty atmospheres in a machine for compressing hydrogen gas. The following is a copy of a testimonial given to Mr. Barton, by the ingenious Mr. Perkins.

"MR. JOHN BARTON,

"SIR,—I have used your Patent Piston and Stuffing-box above three months in my engine. The friction is *much less* than any I have yet tried. I have had the steam up to 1400 *lbs. to the inch*, without any leakage to signify. I generally work with steam from 400 to 500 lbs. to the inch, and find them quite tight enough for all practical purposes. The wear appears not to be the least objection to them.

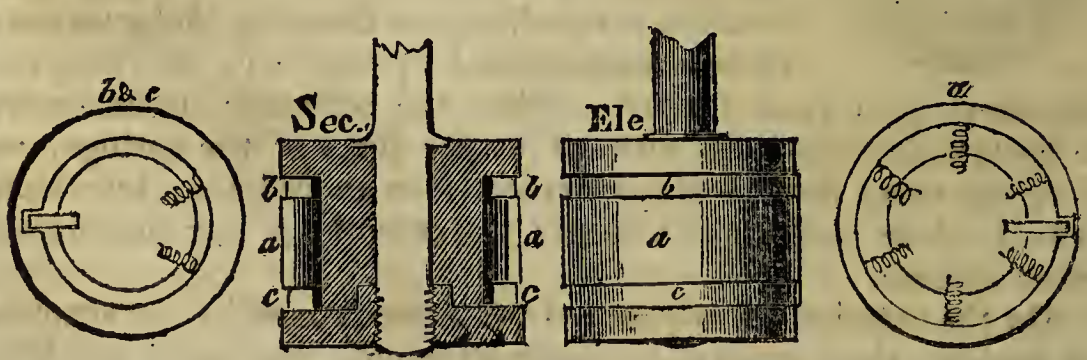
"41, *Water Lane*, "I am, Sir, your obedient Servant,
"*July 24th*, 1823. "JACOB PERKINS."

Messrs. Thornhill and Morley, of New Bond Street, state that before the application of Mr. Barton's metallic piston to their engine they required steam of a pressure of 73 lbs. to the inch, but that now, by its use, they do more work with the steam at 43 lbs. only; and that during three years they had not a single stoppage, as it continued perfectly tight!

We have it in our power to add several other respectable certificates to the same effect, which have already appeared in print, but it is unnecessary to repeat them here.

We have now to describe another form of metallic piston, for which a patent was taken out by Mr. Perkins, in June, 1823, at the time he had Mr. Barton's in use, as mentioned in the preceding testimonial. The specification of the patent (which embraces a variety of improvements connected with the steam engine) states this to be a new arrangement of rings for metallic stuffing, and to consist in keeping the expanding opening of a flexible ring steam tight, by means of eccentric and non-expanding rings.

The annexed figures shew the arrangement of all the parts of the contrivance.



In the elevation (marked Ele.) *a* is a flexible expanding ring, and *b c* two inflexible and non-expanding rings. The adjoining figure (marked Sec.) gives a vertical section of the whole of the piston. The figure *a* is a plan of the flexible expanding ring shewn in the elevation and section; and the figure *b c* gives also a plan of the two inflexible rings marked *b c* in the elevation and section.

In the plan *a* of the flexible ring an opening is shewn, and to prevent the escape of the steam at this opening the two inflexible rings *b c* are placed one on each side. In the latter it will be observed there is a notch in which a guide pin is fixed, and that there are two helical springs which press the side of the ring to which they are attached eccentrically from the piston. When these two rings are fitted on to the piston, the opening in the broad flexible ring *a* should be placed on the opposite side to that on which the notches in the inflexible rings are placed. By this arrangement when the piston is put into the cylinder, these two eccentric rings, *b* and *c*, will press against that part of the cylinder immediately above and below the opening in the elastic ring *a*, and will thereby supply the deficiency occasioned in the piston by such opening in the elastic ring; and reversing the action of the parts above described, the same may be equally well applied as a stuffing box for the piston rod.

MR. WILSON'S PROCESS FOR MAKING ARTIFICIAL STONE CHIMNEY-PIECES.

*(From the Transactions of the Society of Arts)**

Take two bushels of sharp drift-sand, and one bushel of sifted slaked quick-lime; mix them together with as little water as possible, and beat them well up together for half an hour every morning, for three or four successive days; but never wet them again after their first mixture.

To two gallons of water, contained in a proper vessel, add one pint of single size, made warm; a quarter of a pound of alum, in powder, is then to be dissolved in warm water, and mixed with the above liquor.

Take about a shovel-ful of the first composition, make a hole in the middle of it, and put therein three-quarters of a pint of the mixture of alum and size, to which add three or four pounds of coarse plaister of Paris; the whole is then to be well beaten and mixed together rather stiff; put this mixture into the wooden moulds of your intended chimney-pieces, the sides, ends, and tops of which moulds are to be made of moveable pieces; and they must be previously oiled with the following mixture:

Take one pint of the droppings of sweet oil, which costs about one shilling the pint; and add thereto one pint of clear lime-water, made by pouring boiling water on lumps of chalk-lime in a close

* The Society of Arts voted Mr. Charles Wilson of Worcester Street, Borough, the sum of twenty-five guineas for communicating his process.

vessel, till fully saturated: when the lime-water becomes clear, it is fit to be added to the oil, as above-mentioned; and on their being stirred together they will form a thick oily mixture, or emulsion, proper to apply to the moulds.

In forming the side, or jamb of a chimney-piece, the mould is to be first half-filled with the sand, lime, and plaister composition; then two wires, wrapped round with a thin layer of hemp or tow, and which wires are nearly the length of the piece to be moulded, are to be placed in parallel lines lengthways, in the mixture or composition in the mould; and afterwards the mould is to be filled up with more of the composition; and if there be any superfluous quantity, it is to be struck off with a piece of flat board.

The lid or top part of the mould is then to be placed upon it, and the whole must be subjected to a strong pressure, either from weighted levers, or a screw press. The composition is to remain under this pressure for twenty or thirty minutes; the precise time necessary, may be known by examining a small specimen of the composition, reserved purposely to determine the time it requires to harden and set firm in.

The sides of the moulds are to be held together by iron clamps and wedges.

The wires above mentioned answer the double purpose of giving strength to the jambs, and of retaining the whole mass together, in case it should at any time be cracked by accident.

The chimney-pieces may be made either plain or fluted, according to the mould; and when moulded, they are finished off by rubbing them over with alum-water, and smoothing them with a trowel, and a little wet plaister of Paris.

A common plain chimney-piece of this composition, is sold at only seven shillings; and a reeded one at twenty-eight shillings, completely fitted up.

MR. STEART'S* PROCESS IN MANUFACTURING THE LINO-STEREO TABLETS.

The extra stout drawing-papers, or card boards, as they are usually denominated, are always made by pasting several sheets of paper together, in the manner of a common pasteboard, and afterwards bringing them to a smooth face by pressing and rolling. The pasting is a dirty operation, and the occasion of many defects, some of which are fatal to the degrees of perfection and nicety required in a good drawing-board. Another great defect is, that the far greater part of the drawing and writing papers now in use in this country, are of a hollow or spungy texture; this arises from their being made of an indiscriminate mixture of linen and cotton; the greater elasticity of the latter preventing its fibres from closely uniting with those of the flax; the consequence is, an irregular surface, and a porous spongy substance, very different from that

* Of De Montalt Paper Mills, Coomb Down, near Bath.

which an adherence to the good old-fashioned practice of using fine linen rags only in the manufacture of superior papers would produce.

The lino-stereo tablet is entirely free from these objections, for the following reasons :—first, it is not composed of several sheets pasted together, but is moulded from the pulp of any required thickness, in one entire mass ; thus the risk of pasting is avoided, and no separation of the component parts can possibly take place, though wetted ever so often : secondly, instead of being composed of linen and cotton, it is wholly and solely manufactured from the best and purest white linen rags, most carefully selected ; and, consequently, without the aid of the chloride of lime, or any bleaching process whatever.

The Process.—In selecting the raw materials for the manufacture of the lino-tablets, great care is taken to preserve the *best and purest white linen* rags only, rejecting all muslins, calicoes, and every other article made of *cotton*. The linen rags are then carefully sorted, overlooked, and cleaned, washed and beaten into pulp in the usual manner practised by paper-makers of the first class.

The pulp being ready, and diluted in the vat with the proper proportion of pure water, the workman dipping his mould first into the vat, takes it up, filled with pulp to the top of the deckle ; and holding it horizontally and gently shaking it, causes the water to subside, leaving the pulp very evenly set upon the face of the mould ; having rested it for a moment or two in the bridge of the vat, the compresser with its face downwards, is now carefully laid upon the sheet or tablet, and both together placed in the small press close at hand, where it is submitted to a very gentle pressure, in order to exclude a great proportion of the water remaining in the sheet ; it is then withdrawn, the compresser and the deckle are then both taken off, and another workman couches it, by very dexterously turning the mould upside down, and pressing it pretty hard with his hands on one of the fine felts previously laid upon a very level pressing plank, by which means the tablet is left on the felt. The mould is then returned to the vat-man, who repeats the process as before. The coucher, in the mean time, lays another felt upon the sheet or tablet just couched, whereon the second sheet is to be laid in the same manner ; and so on, until all the felts are occupied ; over which another level plank is placed, and the whole drawn away on a small rail road waggon to the great press, where it undergoes a pretty severe pressure.

The tablets will now be found to have sufficient adhesion to bear handling with care, and are separated from the felts, and placed one upon another, so as to form the packs : these packs are to be submitted again to the action of the press, until more water is expelled ; then are parted sheet by sheet, pressed and parted again ; and this is repeated as often as necessary, taking care to increase the pressure every operation, until the face of the tablets is sufficiently smooth : they are then carefully dried, sized, picked, sorted, &c. ; carried to the rolling mill, and several times passed between the polished cylinders, to give them the last finish.

The above is the process for the plain or white tablets. In making the tinted tablets, the following additional particulars are to be attended to :—

The rags are cleansed, washed, and beaten into half stuff in the usual way ; the water being drained off, the pulp is put into a vat with a solution in water of acetate of alumine, or sulphate of iron, as a mordant or ground to fix the colour intended to be made ; the whole is well incorporated, and suffered to remain for half an hour or more, when the colouring tincture, previously prepared, is added ; after which, the whole being returned to the engines, is beaten into fine pulp, and then wrought into fine tablets.

The dyeing materials chiefly made use of by Mr. Steart, are, mangrove bark, quercitron bark, best blue Aleppo galls, sulphate of iron, and acetate of alumine. A due combination of these materials produce a great variety of drabs, greys, sand-colours, &c.—*(Abrid. Tran. Soc. Arts.)*

NESBITT'S PATENT MOSS PAPER.

Mr. Alexander Nesbitt, of Upper Thames Street, has recently taken out a patent for the fabrication of a coarse kind of paper especially applicable to the sheathing of ships, in the manner that the tarred brown paper is usually applied. The material is a peculiarly soft kind of moss, which grows abundantly in the ditches and low grounds of Holland. In that country and in several of the northern states of Germany, paper made from this material is employed as a covering to the bottoms of ships between the wood and copper sheathing, and is found to be peculiarly serviceable in preventing leaks ; owing to its absorbent quality it swells up making a close and firm packing under the copper.

The manufacture of paper from this substance is exceedingly simple. The moss is first to have the adhering earth washed from it, then to be chopped in short pieces (about half an inch long) in a similar machine to a tobacco cutting mill ; after this it is to be soaked for several hours in water, then formed into sheets in the ordinary way between moulds, placing each sheet between woollen cloths ; in this state they are to be subjected to mechanical pressure, afterwards thoroughly dried, and, lastly, pressed again between sheets of brown paper (placed alternately), when the manufacture is completed.

MISCELLANEOUS INVENTIONS,
Discoveries, & Processes in the Useful Arts.

New Mechanical Power.—The Milan Gazette states, that a man named Ignazio Roberts, of Troina, in Sicily, has invented a machine with which ships may be moved by hand, instead of the dangerous steam-engines. Three persons, one of whom works an hour and rests himself two hours, are sufficient to move a vessel of

20 tons (40,000lbs.), and so in proportion for larger vessels. The expence of the machine is from 600 to 1000 ducats. He affirms that he has made repeated trials of it, and offers to apply it to any vessel for which it may be required, and to indemnify the proprietor for the first two trials if the machine should not act satisfactorily.

Weaving.—A silk loom has recently been invented at Lyons, the mechanism of which is said to be extremely simple, yet allows of one man to weave five pieces of silk at a time. The loom has been examined by competent persons appointed for that purpose, who have reported very favourably of its advantages, especially as regards the great saving of labour effected by it. The Academy of Sciences have testified their opinion of its merits, by rewarding the inventor, M. Le Brun, with their honorary gold medal.

To make an instantaneous Bleaching Liquid.—Put a small quantity of red lead into muriatic acid, when chlorine is instantly evolved; add water to the mixture, and when any thing having spots or stains is immersed into it, they will be immediately removed, or the colour of the piece itself.

To Tin Iron and Copper Vessels.—We insert this following Recipe, in compliance with the wish of a correspondent (C. N.) Iron which is to be tinned, must be previously steeped in acid materials, such as sour whey, distiller's wash, &c. then scoured and dipped in melted tin, having been first rubbed over with a solution of sal-ammoniac. The surface of the tin is prevented from calcining by covering it with a coat of fat. Copper vessels must be well cleansed; and then a sufficient quantity of tin with sal-ammoniac is put therein and brought into fusion. and the copper vessel moved about. A little resin is sometimes added. The sal-ammoniac prevents the copper from scaling, and causes the tin to be fixed wherever it touches.

LETTERS OF INQUIRY.

Ironing of Linen.—"In the process of ironing linen I have always found that when I begin to use a common flat iron quite hot it never makes the least soil whatever, but as it gets cool it uniformly does so, although my weak capacity would induce me to suppose it would become more and more clean from using. If any of your ingenious correspondents would condescend to explain the cause they would oblige,

"Sir, your most obedient Servant,

"*7th Dec.* 1825. "SALLY SOAP-SUDS."

[Perhaps Sally uses too much starch to her linen, which first adhering to the iron, is by the continued heat gradually converted into charcoal. If this be the cause, Sally must either use less starch or clean her iron oftener.] Ed.

Improved Barometers.—"In No. 27 of your useful publication, I see mention made of an Improved Barometer by a Mr. Daniell, you will much oblige one of your subscribers by informing him in your next number of the direction of Mr. Daniell.

"*5th Dec.* 1825. "A. Z."

LIST OF NEW PATENTS.

DIVING BELLS.—To Thomas Steele, of Magdalen College, Cambridge, for improvements in the construction of diving bells, or apparatus for diving under water. Oct. 28. Six months.

NAVIGATION.—To J. and S. Seaward, of Poplar, Middlesex, for improved methods of propelling all kinds of vessels on canals, rivers, and other shallow waters. Nov. 1. Six months.

"CIRCUMVOLUTION BRUSH."—To William Ranyard, of Kingston, Surrey, for a circumvolution brush and handle. Nov. 1. Two months.

SPINNING SILK.—To Vernon Royle, of Manchester, for improvements in the machinery for cleaning and spinning of silk. Nov. 1. Two months.

BOOKS.—To J. J. Hawkins, of Pancras Vale, Middlesex, for improvements in the apparatus used in the manufacturing and preserving of books. Nov. 1. Six months.

COCKS OR VALVES.—To J. and W. Ridgway, of the Staffordshire Potteries, for an improved cock tap, or valve, for drawing off liquors. Nov. 1. Two months.

WHEELED CARRIAGES.—To Thomas Seaton, of Bermondsey, Surrey, for improvements on wheeled carriages. Nov. 7. Six months.

WHEELS.—To Geo. Hunter, of Edinburgh, for an improvement in the construction, use, and application of wheels. Nov. 7. Six months.

WHEELED CARRIAGES.—To Thomas Shaw Brandreth, of Liverpool, for an improved mode of constructing wheel carriages. Nov, 8. Six months.

COOKING APPARATUS.—To Wm. Erskine Cochrane, of Regent-street, Middlesex, for an improvement in cooking apparatus. Nov. 8. Six months,

CHIMNIES.—To J. W. Hiort, Office of Works, Whitehall, for an improved chimney or flue. Nov. 8. Two months.

SUBSTITUTE FOR GALL-NUTS.—To C. L. Giroud, of Lyons, France, for a chemical substitute for gall nuts as used in the arts. Nov. 8. Two months.

NAIL-MAKING.—To James Wilks, and John Erroyd, of Rochdale, Lancashire, for an engine for cutting nails, sprigs, and sparrowbills, on an improved system. Nov. 8. Six months.

ROAD-MAKING.—To J. J. A. M'Carthy, of Pall Mall Place, Westminster, for new or improved pavement, or covering for streets, roads, &c, Nov. 10. Six months.

CABLES AND ANCHORS.—To Benj. Cook, of Birmingham, for a new method of rendering ships' cables and anchors more secure. Nov. 10. Six months.

BOOK-BINDING.—To Benj. Cook, of Birmingham, for improvements in the binding of books, &c Nov. 10. Six months.

"GERMAN WEIGH BRIDGES."—To J. G. Deyerlein, of Mercer-street, Middlesex, for improvements in weighing machines, which he denominates "German Weigh Bridges." Nov. 10. Six months.

ALLOYS.—To Samuel Parker, of Argyle-street, Middlesex, and W. F. Hamilton, of Long-lane, Surrey, for a certain allay or alloy of metals. Nov. 12. Six months.

WEAVING.—To Edward Bowring, of Goldsmith-street, London, and Robert Stamp, of Buxted, Sussex, weaver, for improvements in the weaving or preparing silk, and other fibrous materials. Nov. 17. Six months.

PAPER-MAKING.—To James Guestier, of Fenchurch-buildings, London, for a mode of making paper from certain substances. Nov. 17. Six months,

SPINNING.—To Alexander Lamb, of Princes-street, London, and Wm. Suttill, of Old Brompton, Middlesex, for improved machinery for drawing, roving, and spinning flax, hemp, and waste silk, Nov. 17. Six months.

HATS.—To Geo. Borradaile, of Barge-yard, Bucklersbury, for an improved method of making or setting up of hats or hat bodies. Nov. 17. Six months.

TO OUR READERS AND CORRESPONDENTS.

Ch—s A—n will find a description of the machine he enquires about in our 32d Number.

The communication mentioned by G. G. we have certainly never received. The nature of the subject is peculiarly suited to our publication.

Our Bristol Correspondent will receive a letter from us in a post or two.

"An Old Subscriber" is informed, that Mr. Beacham's shop is very near to Northumberland Street, Strand.

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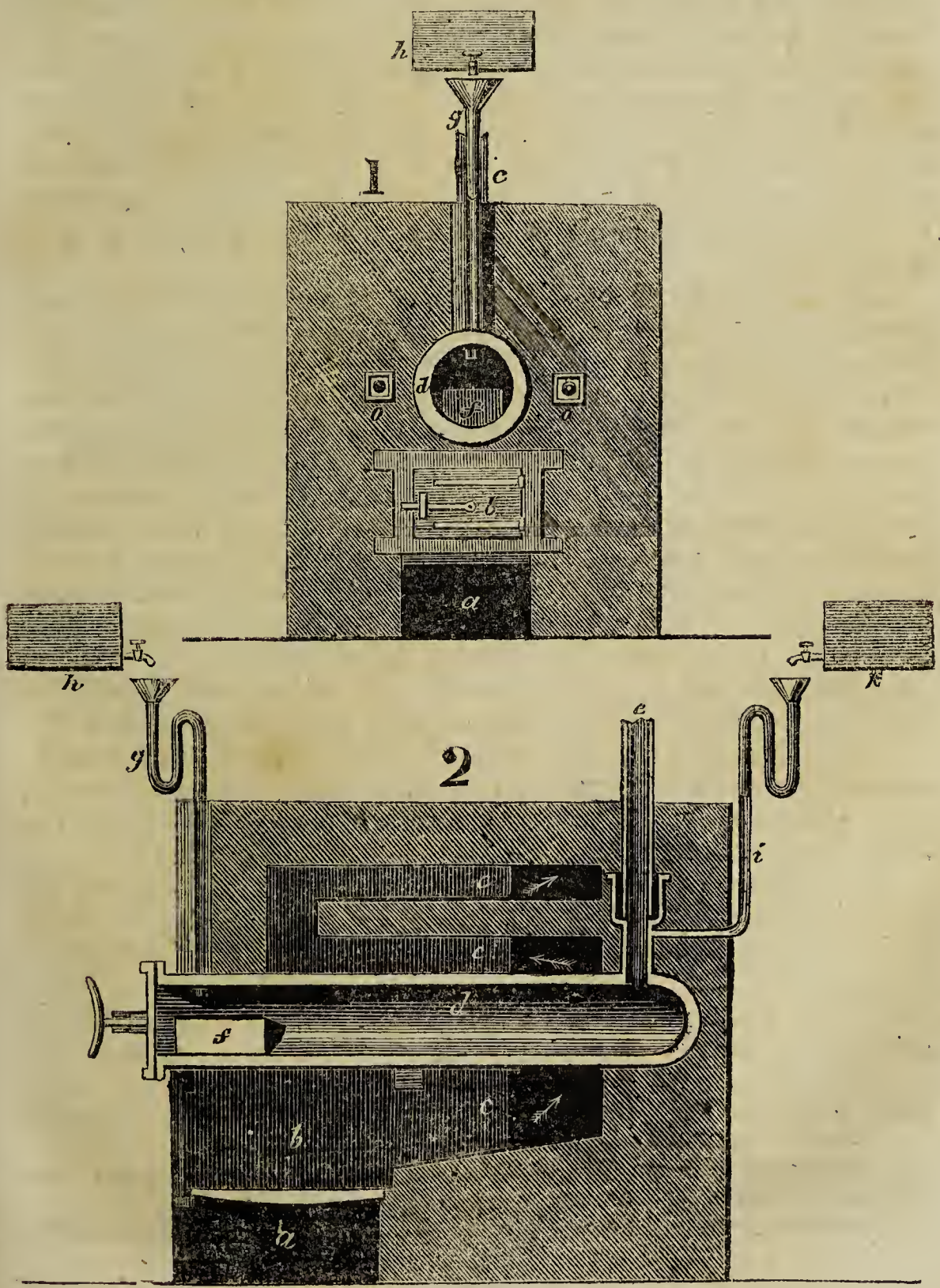
CONTENTS:

Vere & Crane's improved Gas Apparatus, 177
Manton's Patent Lead Shot, ... 179
Jennings & Betteridge's improved Method of working Pearl Shell into Ornamental Devices, ... 180
An improved Glaze for Porcelain, ... 181
Gas Condensing Pumps, ... 182
Prevention of Dry Rot, ... ib.
Hard Black-lead Pencils for Artists, ... 183
Improved Paper for Draughtsmen, ... ib.
Jessop's Patent Metallic Pistons 184
Description of the great Bandana Gallery, 185
MISCELLANEOUS.—Mines discovered in America, 189,—Earthquakes, ib.—Diving Bells, 190,—Tortoise-shell Work, ib—Fire-proof Wood, ib Cannon Founding, ib:—The Enterprize Steam Packet, ib.—Great American Road, 191,—Monument to the Memory of Washington, ib. Roberts's Safety Hood, ib.—Short Mode of Multiplication, 192,—To Correspondents, ib:



VERE & CRANE'S PATENT IMPROVED GAS APPARATUS.

VERE & CRANE'S IMPROVEMENTS IN THE MANUFACTURE OF GAS FOR ILLUMINATION;

MORE ESPECIALLY APPLICABLE TO THE

DISTILLATION OF TAR FOR THAT PURPOSE.

In the generation of sub-carburetted hydrogen gas from coal, great inconvenience has been sustained by the deposition of adhesive matters in the pipes leading from the retorts, by which they gradually became choked up; in consequence, rendering it frequently necessary to suspend the process, for the purpose of clearing out the deposit. Our readers are well aware that a considerable quantity of tar is also obtained as a separate product in the gas manufactories; in some of them this tar was afterwards decomposed for the purpose of generating gas (which it yields in considerable quantity) but it was discovered that the tar thus employed caused a greater evil in the pipes by a deposition of asphaltum, which quickly rendered them unserviceable; besides this, it was found that the gas produced from this material afforded but a feeble light, and emitted much smoke: for these reasons the decomposition of coal tar was discontinued in most manufactories.

As a remedy for these evils, Messrs. Vere & Crane* have proposed the invention delineated in our frontispiece. The specification states the apparatus to be applicable to the distillation of coal, coal-tar, tar-oil, oil, vegetable oil, animal oil, and all other solid or liquid matters from which carburetted hydrogen may be obtained; and the process consists in introducing into the retort a constant stream of water, or a current of steam into the exit pipe, which, mixing with the volatile matters as they rise from the substance under decomposition, causes them to fall down again into the retort, without proceeding further to choke up the pipes, while the more gaseous products pass on through the steam in a more pure state to their destination to be afterwards treated in the usual way. The gas obtained from tar by this process is said to burn with a brilliant white flame instead of the dull smoky light as before mentioned.

Fig. 1 is a front elevation of the improved retort set in the brick-work of the furnace. *Fig.* 2 is a vertical section of the same, shewing more advantageously its construction and the mode of operating. The letters have reference to the like parts in each of the figures.

a is the ash pit, *b* the furnace, *c c c* the flue winding round the retort; *d* the retort, with its lid fastened in the usual way by a cross bar and screw; *e* the exit pipe through which the gas escapes as it is generated; *f* is a wrought-iron pan or tray to hold tar or other liquid matter to be distilled, *g* a supply pipe to *f*, leading from the cistern or reservoir *h*; *i* is a water pipe, and *k* a cistern of water.

When tar, for instance, is to be operated upon, the retort partly filled with coke or broken bricks,† is to be brought to a bright red

* Mr. William Vere, Crown Row, Mile end Old Town, engineer, and Mr. Henry S. Crane, of Stratford, Essex, manufacturing chemist.

† Coke is preferable for this purpose, as after it becomes saturated with

heat, which may be ascertained by inspection through the holes *o o*, shewn in *fig.* 1, which are provided with stoppers; the cock of the water pipe is then to be opened to admit water to flow in a slender stream into the retort, the heat of which immediately converts it into vapour; this done, tar is to be admitted from the reservoir *h* to flow through the pipe *g* into the pan *f*, where it is quickly decomposed; the gas, as it ascends and enters the exit pipe, necessarily passes through a large volume of steam, which causes an instant precipitation of the carbonaceous matters, which would otherwise lodge in the pipes, and ultimately obstruct the passage of the gas through them. The gas, thus relieved in the earliest stage of the principal contaminating matters, has then to pass through the ordinary purifications, by which it is ultimately delivered in a state of great purity to the burners for consumption.

When coal or other solid matters are to be decomposed for obtaining the gas, the pan *f*, the pipe *g*, and the reservoir *h*, are to be removed, and the operation is to be conducted without them; retaining, however, the use of a current of steam as in the former case. The quantity of water required for this purpose will depend upon the nature of the material under distillation, but in general eight or ten gallons of water to 1000 cubic feet of gas will be found adequate to the precipitation of the carbonaceous matter. The stream of water should of course be constant and uniform; and it would be desirable to introduce a current of steam from an engine boiler if there be one on the premises, in lieu of the water, especially when operating upon coal.

MANTON'S PATENT LEAD SHOT.

This invention consists simply in covering the surface of lead shot with mercury, or as it would commonly be called, *quicksilvering* them, which of course makes them look very pretty; but of their utility we will leave the patentee to speak, who is under the necessity of saying so in order to obtain the grant of his exclusive privilege. In the specification he states, that it is much more convenient for use, more cleanly, and not so liable to injure the quality of the game killed by it, or to stick to the barrels of the fowling pieces.

The process of preparing the article is as follows: a barrel made of iron, and mounted on an axis, so that a rotary motion may be given to it, is to be first provided; into this are to be put 100lbs. of *unglazed* lead shot, 1lb. of quicksilver, and the remaining space filled up with water. The barrel is then to be turned round about until the whole of the mercury has spread itself over and coated the surfaces of the shot, to which it will adhere. The shot is next to be washed in water, and dried on cloth stretched upon frames, and the drying expedited by rubbing them over with a sponge to take up the moisture.

---

the precipitated carbonaceous matters, it serves as well or better for the furnace in heating the retort.]—Ed.

As lead has a very powerful attraction for mercury, the silvery-white surfaces of the freshly coated shot will be soon exchanged for a dusky black one, owing to the more intimate combination of the metals. Sportsmen had therefore better dispatch their mercurial messengers to the birds before their transient beauty vanishes; besides, the little sable spheres may, perhaps, mourn over their departed splendour, and sulkily *stick in the gun.**

JENNINGS AND BETTERIDGE'S NEWLY PATENTED IMPROVED METHOD OF WORKING PEARL SHELL INTO ORNAMENTAL DEVICES.

A NEW process of working pearl shell into a variety of devices, for the purpose of applying it to ornamental uses in the manufacture of japan ware, and other articles, has very lately been invented by Messrs. Aaron Jennings and John Betteridge of Birmingham. The process is similar to that of engraving on metals in relief, by the aid of corrosive acids and the etching point.

The pearl shell is first divided into very thin plates or leaves, such as form the 40th to the 100th part of an inch, and the devices or patterns are drawn upon them in an opaque turpentine varnish; strong nitrous acid is then brushed over the plates repeatedly, until those parts left bare or undefended by the varnish are sufficiently corroded or "eaten way" by the acid. The varnish being now washed off by a little oil of turpentine, the device which the acid has not touched is found to be perfectly executed. If the design is to be after the manner of common etching on copper, then the process upon the shell is precisely similar to that upon the metal; with which our readers are doubtless too well acquainted to need a description.

When a considerable number of ornaments are required of the same size and pattern, a sufficient number of the plates are cemented together by glue, with only one plate having the device etched upon it placed on the outside; these are then made fast in a pair of clams, or screwed between the jaws of a vice, and carefully sawn out altogether by a very fine frame saw: the cemented shells are then thrown into warm water, which softens the glue and quickly separates the pieces.

When several devices upon a plate have been bit in, they may be laid upon a flat surface and cut through with a knife-edged tool, for thick pieces the saw is put in requisition, and the finishing executed by a variety of sharp gravers and instruments.

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* Black-lead (or plumbago) is the substance ordinarily used for the glazing of shot, and is employed very generally as an anti-attrition material to facilitate the sliding of one hard substance over another. We would, therefore, enquire whether shot glazed in the common way are not less likely to stick in a gun than the above amalgam?

ON AN IMPROVED GLAZE FOR PORCELAIN.

BY MR. JOHN ROSE, OF COAL-PORT, SHROPSHIRE.

*(From the Transactions of the Society of Arts.)**

SIR, *Coal-port, March 24th,* 1820.

HAVING for some time made use of a glaze for porcelain which gives me great satisfaction, and into the composition of which neither lead nor arsenic are admitted; I beg leave to submit the same to the consideration of the Society of Arts, &c.

The common glaze for porcelain, and the finer kinds of earthenware, contains a considerable proportion of glass of lead; this ingredient, however, on account of its being mixed with a certain proportion of siliceous earth, and other vitrifiable materials, unites with them into a glass, which, although easily fusible, is not in the least corroded or acted on by any articles of food. It is not, therefore, from the apprehension of any injury to the health of those who use vessels of porcelain, that the use of lead, in the glaze is objectionable; but because it is extremely liable to combine with, and degrade, the more delicate colours, especially those given by preparations of chrome and of gold. This is particularly the case in the more expensive and elaborate products, which, on account of the multiplicity of their colours, require to be repeatedly heated or *fired.* I trust, therefore, that the Society will consider the communication of a receipt for glazing, in which the above-mentioned defects are avoided, as worthy of their favourable notice.

The principal ingredient of my glaze is felspar, of a somewhat compact texture, and a pale flesh-red colour, which forms veins in a slaty rock, adjoining to the town of Welsh Pool, in Montgomeryshire. This material being freed from all adhering pieces of slate and of quartz, is ground to a fine powder; and being thus prepared, I mix, with 27 parts of felspar, 18 of borax, 4 of Lynn sand, 3 of nitre, 3 of soda, and 3 of Cornwall china clay. This mixture is to be melted to a frit; and is then to be ground to a fine powder, 3 parts of calcined borax being added previously to the grinding.

The specimens accompanying this letter, are,

1 The felspar in its rough state.
2 Do. ground to a fine powder.
3 Some of the glaze ready prepared for dipping.
4 Specimens of porcelain glazed.
5 Do. both glazed, and afterwards painted, in order to shew the solidity and brilliancy of the colours when used on this glaze.

A. Aikin, Esq: I am, Sir, &c. &c. &c.
Secretary, &c. &c. JOHN ROSE.

Some of the specimens furnished by Mr. Rose, were placed by the committee in the hands of Mr. Muss, and of other artists, in order to be submitted to experiment, both with regard to the perfection of

* The Society voted their Isis Gold medal to Mr. Rose for his invention.

the glaze itself at high temperatures, and its re-action on the several colouring materials.

Mr. Muss's trial-pieces were proved first in a common kiln, and afterwards were subjected to the action of a much higher degree of heat than it is possible that they can ever be exposed to in the fair course of enamelling. In this extreme heat, the ground of the ware is not in the least degree softened or affected; the glaze remains firm and perfectly uniform, without any specks or spits having been produced on its surface; and the colours, even the pinks and chrome greens, come out remarkably well upon it. Mr. Rose's glaze not being so hard as that used by the French manufacturers, incorporates more completely with the colours, and renders them perfectly firm; whereas, every artist knows that colours laid on French porcelain are extremely apt to chip off, crackle, and flake, if it be necessary to make them pass the fire a second time. On the whole, therefore, Mr. Muss considers the samples placed in his hands by the committee, as the best both in body and glaze, that have ever come under his observation.

Similar reports of the excellency of the glaze, in the particulars above-mentioned, were made by the other artists who had made trial of it.

GAS CONDENSING PUMPS.

"*To the Editor.*

"SIR,

"IN the account you have given in the Register of last Saturday of the Condensing Pumps in use at the London Portable Gas Company's Works, you state that they were invented by me *about four years ago*, whereas, you will find that, nearly *six* years ago, I published in the Repertory of Arts for May, 1820, two articles, giving an account of the principle upon which I proposed to construct Gas Condensing Pumps, and the best pumps now in use at the above establishment for that purpose, are made as therein proposed, the syphons being partially filled with mercury: water and oil having been found, as I feared, 'to imbibe the gas and discharge it rapidly.'

"I am, Sir,

"33, *Cornhill*, "Your most obedient Servant,

"23*rd Dec.* 1825. "DAVID GORDON."

PREVENTION OF THE DRY-ROT.

"*To the Editor.*

"SIR,

"The following application, for the prevention of the dry-rot in houses, has, to my knowledge, proved effectual in several instances; and it has the important recommendation of being a very inexpensive process.

"In building a house in a damp situation, a layer of the iron

scales, produced at smith's forges, spread over the surface of the ground, has been found to prevent the inroads of that destructive disease. As a further precaution, the joists and timbers of the ground-floor should be washed with a strong solution of green copperas (sulphate of iron), laid on with a brush, repeating this operation, so that every part may be completely covered.

"When any part of a building is to be renewed, in consequence of the dry-rot having already made ravages among the timbers, every vestige of its appearance should be carefully removed; the contiguous parts and the new wood work being then washed with a strong solution of copperas, as before-mentioned, that insidious domestic enemy, yet great friend to the builders, may be set at defiance.

"*Greenwich.* "Yours, &c.
"*Dec.* 19, 1825. "E. TODDY."

HARD BLACK-LEAD PENCILS FOR ARTISTS.

The pure Cumberland black-lead (plumbago) is of too soft and yielding a nature to enable an artist to make a fine clear line; to produce, therefore, a pencil that will effect this, a hard resinous matter is intimately combined with the lead in the following way, which is said to be the invention of Mr. Cornelius Varley.

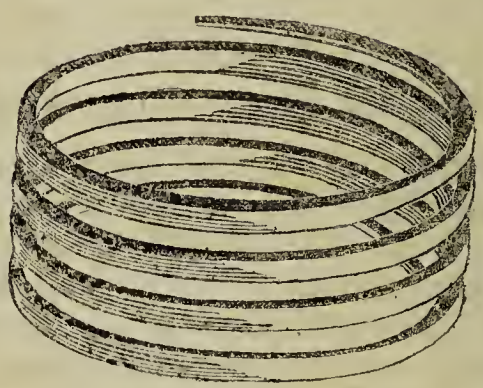
Fine Cumberland lead (in powder) and shell-lac are first melted together by a gentle heat. This compound is then reduced to powder again, then re-melted; then powdered again and re-melted until both substances are perfectly incorporated, and it has acquired a perfectly uniform consistence. The mass is then sawed into slips, and glued into the cedar mountings, in the usual manner of making other black lead pencils. To render them of various degrees of hardness the materials are differently proportioned; the hardest having the most shell-lac, the softer but very little, and the softest none: and their blackness is increased in proportion to their softness.

Improved Paper for Draughtsmen.—A new method of adapting paper for the limners use whether in oil or water colours, has been invented by Mr. Couder. Some gum tragacanth is to be reduced to powder and quickly dissolved in a glazed earthen vessel, containing a sufficient quantity of cold water to give it the consistence of jelly, while it is well-worked with a wooden spatula to free it from lumps. Paper and wove stuffs upon which this composition is carefully and smoothly spread with a brush or hair pencil, and dried before the fire, will receive colours ground in either water or oil, but it is desirable to mix water colours previously with a solution of the gum tragacanth. This preparation will take any colour except ink. If it be wished to retouch any part of the drawing, it should be washed with a sponge, piece of clean linen rag, or a pencil, containing some of this mixture; and the part, if small, will quickly rise and appear as if fresh painted.

JESSOP'S PATENT METALLIC PISTONS.

In our last Number we gave a description of two improved methods of constructing elastic Metallic Pistons; we have now to add the description of a third, which the patentee (Mr. Wm. Jessop, of Butterby Hall, Derby) considers to be an improvement upon those which have already preceded it. *He* says that the expanding Metallic Pistons heretofore made have consisted of a variety of pieces, all of which require the utmost accuracy in fitting; and being acted upon by several springs, the force of which cannot be equally adjusted, they become liable to derangement; and hence their adoption has not been encouraged.

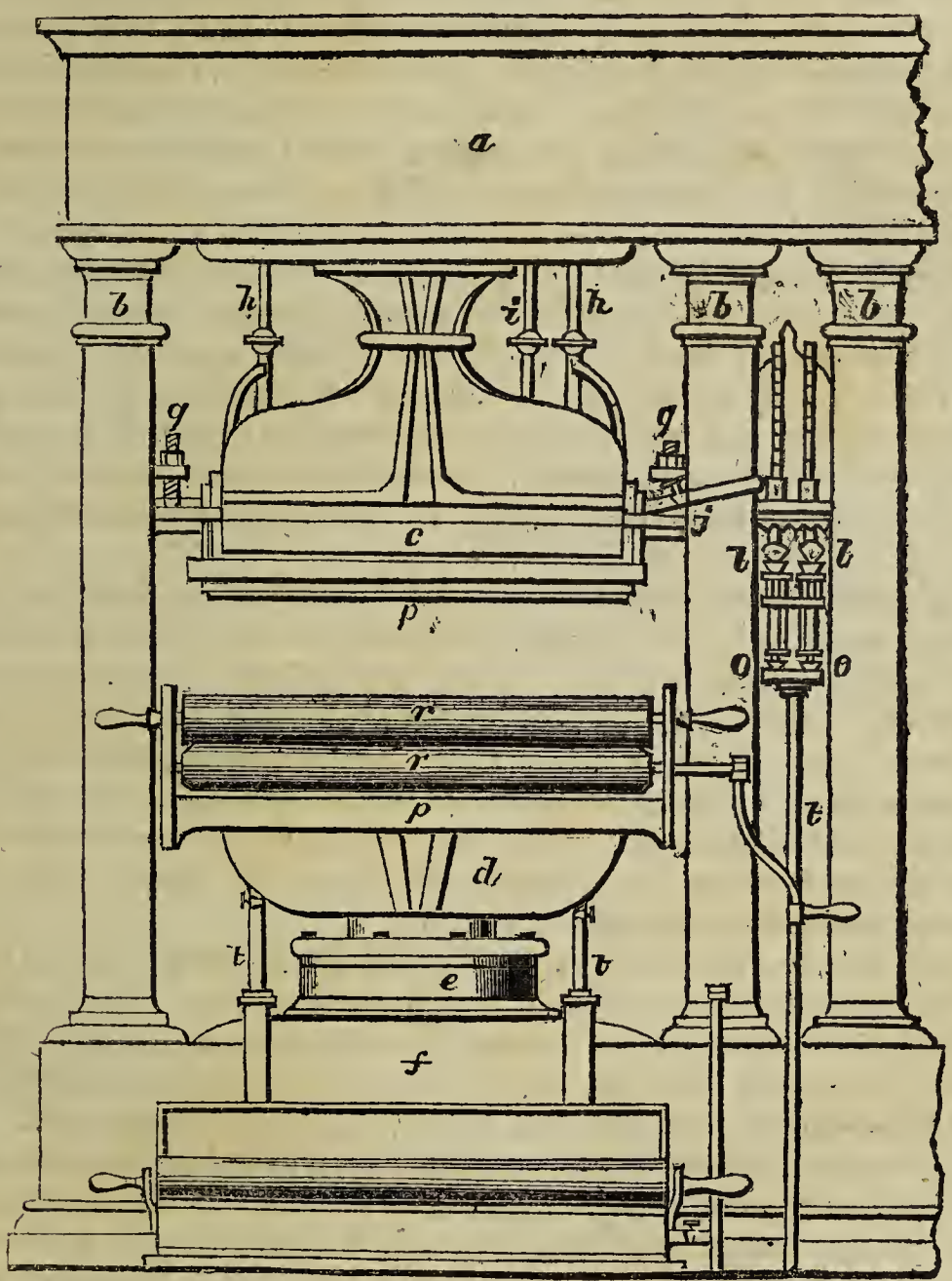
The proposed improvement consists in making the metallic stuffing of only one piece, and that of a spiral figure, as shewn in the annexed cut.



The piston is first to be bound round with hempen packing, as a bed for the metallic portion, and to prevent the escape of the steam. The spiral spring is placed between the upper and lower plates of the piston, through which screw bolts are passed, and by turning the nuts, the plates are brought nearer to one another, and the metallic coils are thereby pressed closely together. Thus restrained above and below, the metallic coil is to expand and contract laterally against the sides of the cylinder, and while it shall effectually prevent the escape of the steam, to press with the requisite force, uniformly, so as to produce very little friction.

The patentee is no doubt sincere in the opinion he has given of his own invention, and if it be really superior to those described in our last Number, we hope it will meet with *universal* adoption; but we cannot help entertaining some doubts on that head. We will suppose that the coiled spring is 18 inches in diameter (for a medium sized cylinder) and to consist of four coils, which will make the spring 19 feet in length; we would now enquire if there is a workman in the kingdom who would undertake to give a spring of such dimensions an uniform elasticity in all its parts, so that the cylinder in which it is placed shall receive an equal pressure in every point of its circumference? If this be a difficult or impossible thing thing to do, in the present state of the arts, does not Mr. Jessop's objection to other inventions, as to the supposed unequal pressure of the springs, apply with infinitely more force to his own? Without presuming to influence the opinion of any one of our readers, we

must say in defence of Mr. Barton's beautiful invention (to which Mr. Jessop's contrivance may be considered to stand particularly opposed), that we much prefer the mode by which he produces the requisite pressure, as it appears to us to be more regular, more direct, and more free, than that described in the present paper.



DESCRIPTION OF THE GREAT BANDANA GALLERY.

In the Turkey-Red Factory of Messrs. Monteith & Co. at Glasgow.*

THE manufactory of Messrs. Monteith and Co. has been long celebrated in the commercial world for the excellence and beauty of its cotton fabrics. The madder-reds rival in brilliancy and solidity any ever produced at Adrianople; and the white figures distributed over the cloth surpass, in purity, elegance, and precision of outline, the original Bandana designs.

* From the Quarterly Journal of Science.

The opulent and enlightened proprietors have been careful to avail themselves of every resource which the latest improvements in chemistry and mechanics could supply. In this respect, their factory deserves to be studied as a school of practical science. The permission now granted of describing their discharging-gallery is a proof of their liberality, as well as of the confidence, justly entertained, that the capital and skill now engaged in their establishment are better securities for the preference which their goods possess in the European market, than the utmost mystery in conducting their processes. Hence they have rarely refused to strangers, respectable for their rank or science, permission to visit their manufactory,—a favour which it is impossible to enjoy without being gratified and instructed.

Their new arrangement of hydrostatic presses was completed in 1818, under the direction of Mr. George Ridger, senior, manager of the works. It consists of sixteen of these engines, beautifully constructed, placed in one range, in subdivisions of four; the spaces between each set serving as passages to admit the workmen readily to the back of the press. Each subdivision occupies twenty-five feet; whence the total length of the apparatus is one hundred feet.

To each press is attached a pair of patterns, in lead (or *plates*, as they are called), the manner of forming which will be described in the sequel. One of these plates is fixed to the upper block of the press. This block is so contrived, that it turns on a kind of universal joint, which enables this plate to apply more exactly to the under plate. The latter rests on the moveable part of the press, commonly called the *sill*. When this is forced up, the two patterns close on each other very nicely, by means of guide-pins at the corners, fitted with the utmost care.

The power which impels this great hydrostatic range is placed in a separate apartment, called the *machinery room*. This machinery consists of two cylinders of a peculiar construction, having cylindric pistons accurately fitted to them. To each of these cylinders three little force.pumps, worked by a steam engine, are connected.

The piston of the larger cylinder is eight inches in diameter, and is loaded with a top weight of five tons. This piston can be made to rise about two feet, through a leather stuffing or collar. The other cylinder has a piston of only one inch in diameter, which is also loaded with a top weight of five tons. It is capable, like the other, of being raised two feet through its collar.

Supposing the pistons to be at their lowest point, four of the six small force-pumps are put in action by the steam-engine; two of them to raise the large piston, and two the little one. In a short time, so much water is injected into the cylinders, that the loaded pistons have arrived at their highest points. They are now ready for working the hydrostatic discharge-presses; the water pressure being conveyed from the one apartment to the other under ground, through strong copper tubes of small calibre.

Two valves are attached to each press; one opening a commu-

nication between the large *prime cylinder* and the cylinder of the press, the other between the small *prime cylinder* and the press. The function of the first is simply to lift the under block of the press into contact with the upper block; that of the second is, to give the requisite compression to the cloth. A third valve is attached to the press, for the purpose of discharging the water from its cylinder, when the press is to be relaxed, in order to remove or draw through the cloth.

From twelve to fourteen pieces of cloth, previously dyed Turkey-red, are stretched over each other, as parallel as possible, by a particular machine. These parallel layers are then rolled round a wooden cylinder, called, by the workmen, a drum. This cylinder is now placed, in its proper situation, at the back of the press. A portion of the fourteen layers of cloth, equal to the area of the plates, is next drawn through between them, by hooks attached to the two corners of the web. On opening the valve connected with the eight-inch *prime-cylinder*, the water enters the cylinder of the press, and instantly lifts its lower block, so as to apply the under plate, with its cloth, close to the upper one. This valve is then shut, and the other is opened. The pressure of five tons in the one inch *prime-cylinder* is now brought to bear on the piston of the press, which is eight inches in diameter. The effective force here, will, therefore, be 5 tons $+ 8^2 = 320$ tons; the areas of cylinders being to each other as the squares of their respective diameters. The cloth is, therefore, condensed between the leaden pattern-plates, with a pressure of 320 tons.

The next step is, to admit the blanching or discharging liquor (aqueous chlorine, obtained by adding sulphuric acid to solution of chloride of lime) to the cloth. This liquor is contained in a large cistern in an adjoining house, from which it is run, at pleasure, into small lead cisterns attached to the presses; which cisterns have graduated index-tubes for regulating the quantity of liquor according to the pattern of discharge. The stop-cocks on the pipes and cisterns containing this liquor are all made of glass.

From the measure-cistern, the liquor is allowed to flow into the hollows in the upper lead plate, whence it descends on the cloth, and percolates through it, extracting, in its passage, the Turkey-red dye. The liquor is finally conveyed into the waste pipe, from a groove in the under block. As soon as the chlorine liquor has passed through, water is admitted, in a similar manner, to wash away the chlorine; otherwise, on relaxing the pressure, the outline of the figure discharged would become ragged. The passage of the discharge liquor, as well as of the water through the cloth, is occasionally aided by a pneumatic apparatus, or blowing machine; consisting of a large gasometer, from which air, subjected to a moderate pressure, may be allowed to issue, and act, in the direction of the liquid, in the folds of the cloth. By an occasional twist of the air stop-cock, the workman also can censure the equal distribution of the discharging liquor over the whole excavations in the upper plate. When the demand for goods is pressing, the air apparatus is much employed, as it enables the workman to double his product.

The time requisite for completing the discharging process, in the first press, is sufficient to enable the other three workmen to put the remaining fifteen presses in play. The *discharger* proceeds now from press to press; admits the liquor, the air, and the water; and is followed, at a proper interval, by the assistants, who relax the press, move forwards another square of the cloths, and then restore the pressure. Whenever the sixteenth press has been liquored, &c., it is time to open the first press. In this routine, about ten minutes are employed; that is, 224 handerkerchiefs (16 + 14) are discharged in ten minutes. The whole cloth is drawn successively forward, to be successively treated in the above method.

When the cloth escapes from the press, it is passed between two rollers in front; from which it falls into a trough of water placed below. It is finally carried off to the washing and bleaching department, where the lustre of both the white and the red is considerably brightened.

By the above arrangement of presses, 1600 pieces, consisting of 12 yards each = 19,200 yards, are converted into Bandanas in the space of ten hours, by the labour of four workmen.

The patterns, or plates, which are put into the presses to determine the white figures on the cloth, are made of lead in the following way.—A trellis frame of cast iron, one inch thick, with turned up edges, forming a trough rather larger than the intended lead pattern, is used as the solid ground work. Into this trough, a lead plate, about one half inch thick, is firmly put, by screw nails passing up from below. To the edges of this lead plate, the borders of the piece of sheet lead are soldered, which covers the whole outer surface of the iron frame. Thus a strong trough is formed, one inch deep. The upright border gives at once great strength to the plate, and serves to confine the liquor. A thin sheet of lead is now laid on the thick lead plate, in the manner of a veneer on toilette-tables, and is soldered to it, round the edges. Both sheets must be made very smooth beforehand, by hammering them on a smooth stone table, and then finishing with a plane: the surface of the thin sheet (now attached) is to be covered with drawing paper, pasted on; and upon this, the pattern is drawn. It is now ready for the cutter. The first thing which he does, is to fix down, with brass pins, all the parts of the pattern, which are to be left solid. He now proceeds with the little tools generally used by blockcutters, which are fitted to the different curvatures of the pattern; and he cuts, perpendicularly, quite through the thin sheet. The pieces thus detached are easily lifted out; and thus the channels are formed, which design the white figures on the red cloth. At the bottom of the channels, a sufficient number of small perforations are made through the thicker sheet of lead, so that the discharging liquor may have free ingress and egress. Thus, one plate is finished; from which an impression is to be taken, by means of printer's ink, on the paper pasted on another plate:—the impression is taken in the hydrostatic press. Each pair of plates constitutes a set, which may be put into the presses and removed at pleasure.

Our engraving exhibits an elevation of one press; *a*, the top or entablature; *b b b*, cheeks of ditto, or pillars; *c*, upper block for fastening upper pattern to; *d*, lower or moveable block; *e*, the cylinder; *f*, the sole or base; *g*, the water-trough, for the discharged cloth to fall into; *h h*, tubes to admit water; *i*, tube for air; *j*, cock to admit liquor from the meter; *k*, cistern, or liquor-meter, having two glass tubes for indicating the quantity of liquor in the cistern; *l l*, glass stop-cocks for admitting the liquor into the cistern; *o o*, stop-cocks for admitting water; *p p*, the pattern plates; *q q*, screws for setting the patterns parallel to each to each other; *m m*, *snuffs* perforated with a half-inch drill. The lower iron frame has corresponding pins, which suit these perforations, so that the patterns are guided into exact correspondence with each other; *r r*, rollers which receive and pull through the discharged cloth, from which it falls into the water-box; *s*, stop-cock for filling the trough with water; *t t t*, waste tubes for water and liquor.

The territory and population of the five principal monarchies of Europe are stated, according to recent calculations, to be as follows:

	SQUARE MILES.	INHABITANTS.
Russia in Europe,	75,154	47,660,000
Out of Do.	292,339	11,714,000
England in Europe,	5,554	21,400,000
Out of Do.	176,971	115,141,000
France in Europe,	10,086	30,749,000
Out of Do.,	,667	,469,000
Austria,	12,265	29,691,000
Prussia,	5,014	11,400,000
Total,	578,050	268,224,000
England alone, more than half, being		136,541,000
Under the dominion of the other four powers,		131,683,000

MISCELLANEOUS INVENTIONS,
Discoveries, & Processes in the Useful Arts.

VALUABLE MINES DISCOVERED IN AMERICA.—Mr. Frederick A. Mayo, of Richmond, in company with a person lately from the mines of Saxony, after exploring the greater portion of the west of Virginia, for minerals, has recently succeeded in discovering a copper and tin mine, each of a considerable extent, and as it respects quality as good as any in Europe; one in Wythe, and the other in Gravson County. *American Paper.*

EARTHQUAKES.—It is a remarkable fact, that the shock of the earthquake which was experienced in the West India Islands on the

23rd. Sept., was sensibly felt at the same date and time at Algiers. So distant a connexion of this appalling phenomenon is hardly, if at all, upon record.

Diving Bells.—Among the list of patents recently sealed (as mentioned in our last number) is one, by T. Steele, Esq. M. A. of Magdalen College, Cambridge, for some very important improvements in the use and construction of the diving bell. The improvement particularly relates to the descent of an engineer, who may remain at any depth beneath the water, and unincommoded by the pressure of condensed air, may work with increased safety and effect, maintaining uninterrupted communication with those above by means of conversation. Mr. S. has likewise constructed an optical instrument for illuminating objects under water; and has contrived an improved method of detaching men from the bell.

Tortoise Shell Work.—The comb makers and horn turners in France, Holland, and Germany make use of the parings and clippings of horn and tortoise shell, in the manufacture of snuff boxes, powder horns, and a variety of useful and ornamental toys. They first soften the materials in boiling water, so as to be able to press it into iron moulds, and then by means of heat unite them intimately into one mass. Care must be taken that the heat be not so powerful as to scorch the material. To ascertain the degree of heat requisite a little experience will suffice; that required for horn is greater than that for tortoise-shell. Care must be taken not to touch them with the fingers, or any greasy substance, as their perfect union would thereby be prevented.

Fire-proof Wood.—A discovery is said to have been made by a Dr. Fuchs, member of the Academy of Sciences at Munich, whereby wood is rendered incombustible. The composition consists of fine granulated earth, well washed and sifted, and afterwards mixed with a solution of the caustic alkali. This mixture being spread on the wood, forms a kind of vitreous coat: proof alike against decomposition by either fire or water. The building committee of the royal theatre in that city, have made two public experiments on two small buildings, one covered with the composition, the other left without A fire was kindled in each equally. That which was covered with the composition remained perfect and entire, while the other was quickly consumed. The cost of the process may be calculated at about 20 pence per 100 superficial feet, as the expence of covering the theatre at Munich which contains about 400,000 feet, amounted to between 4 and 5000 francs.

Cannon founding.—Some experiments are at present being made at Douay, in cannon founding, under the direction of Messrs. Gay Lussac and D'Arcet, which tend to shew that the addition of a small proportion of iron into the alloy, doubles the force of resistance.

The Enterprize Steam Packet,—Which left Falmouth on the 16th August last, arrived safely at the Cape of Good Hope on the 13th October; thus achieving more than half of the great under-

taking, and inspiring confidence in the voyage to India successfully completed. The *Cape Town Gazette* gives the following particulars of this interesting event.

Signal having been made, soon after day-light, that she was standing into Table Bay, a vast concourse of persons assembled on Green Point and at other places from whence a view of the bay can be obtained. The wind being light from the southward and westward, the vessel steamed to her anchorage in magnificent style, under a salute from the castle, which was returned by the Enterprize lowering and immediately rehoisting her colours; and subsequently on passing near the shore, by manning her rigging and giving three cheers.

The greatest distance accomplished in any twenty-four hours was one hundred and ninety miles on the 10th of October, performed, not by steaming, but by sailing. The greatest distance in the same time by steaming was one hundred and sixty-nine miles, on the 3rd September. The voyage occupied fifty-seven days; during only thirty-five of which the engines were employed; and three days were passed at anchor in the island of St. Thomas.

Great American Road.—This gigantic undertaking is intended to form a connecting line between the republic of Mexico, and the most northern of the United States.

Monument to the Memory of Washington.—A magnificent monument to the memory of this truly illustrious man is about to be erected in the city which bears his name. It is to be 130 feet high; the design in imitation of that of Thrasybalus, the famous Athenian general, who, assisted by only thirty friends, attempted and succeeded, the expulsion of the thirty tyrants from his country. The cost is estimated at 67,000 dollars, to be defrayed by subscription, which amount we doubt not is already realised.

ROBERTS'S SAFETY HOOD.

"Sir,

"Some time since the different Scientific Journals teemed with accounts of a Safety Hood, for enabling the wearer to remain without danger in an impure atmosphere. The name of the inventor I believe was Roberts. As I have not seen the contrivance I am anxious to know whether it is manufactured for sale, and if so, where it may be had. I should be glad to know whether the ingenious inventor has turned his attention to an extended application of his hood. As it is now made, the supply of fresh air is derived from *below*, the impure medium being supposed rarified, and occupying the upper region of an apartment. But it might be of essential service to have a means of drawing fresh air from *above*, so as to be able to descend with impunity into a noxious gas of greater density than the atmosphere; such as may be met with in wells, brewers' vats, &c.

"If the inventor, or any of your readers, would favour me with the requisite information, I shall esteem it a particular favour.

"X. X."

Short Mode of Multiplication: Until your correspondent *Arithmos* procures his Arithmometer, perhaps the following short mode of multiplication will be of some convenience to him. N. I.

To multiply any number by 25, add two cyphers to the number given, and divide by 4,—thus 637 + 25.

Ex.	637	
	25	
	3185	
	1274	4)637,00
	15925	15,925

To multiply any number by 9, 99, or 999, add as many cyphers as there are figures in multiplier,—then subtract multiplicand from total;—thus, 468 + 99.

Ex.	468	
	99	
	4212	468,00
	4212	468
	46332	46332

To multiply any number by 125 add three cyphers to the multiplicand and divide by 8;—thus, 8632 + 125.

Ex.—	8632	
	125	
	43160	
	17264	
	8632	4)8632.000
	1079000	1079000

TO OUR READERS AND CORRESPONDENTS.

The subject matter of Mr. G. H———'s paper is not of sufficient general interest for publication.

We thank R. S. for his friendly suggestions, and will endeavour to profit by them.

I. I.—W. Lindsay, and "An Artist" are received: the subjects are under consideration, and will, probably, be inserted in our next.

Mr. E. ought really to pay the postage of his letters, as other correspondents do; more especially, as the matter of them only concerns himself, and can be no manner of advantage to us, while they occasion us a great waste of time.

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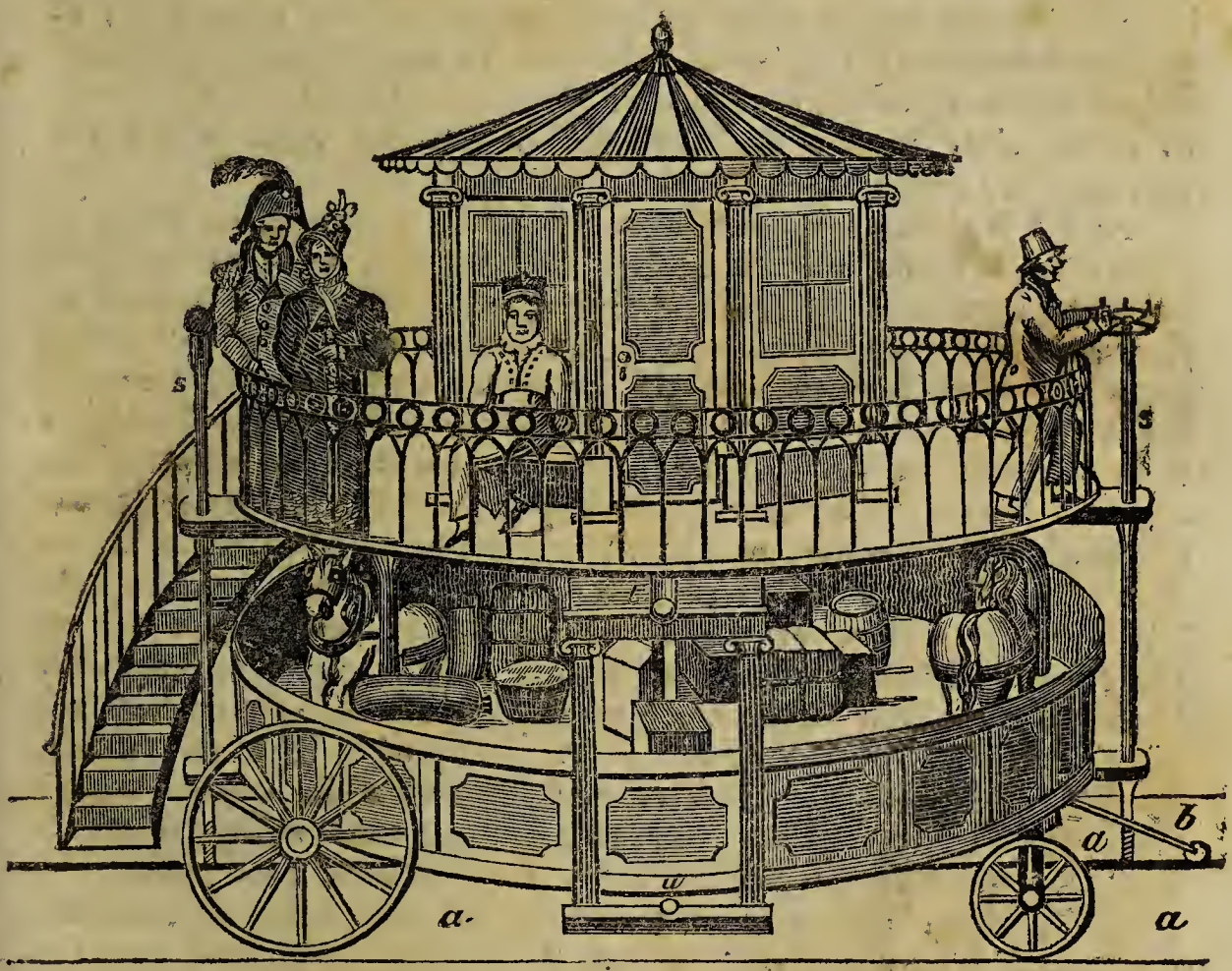
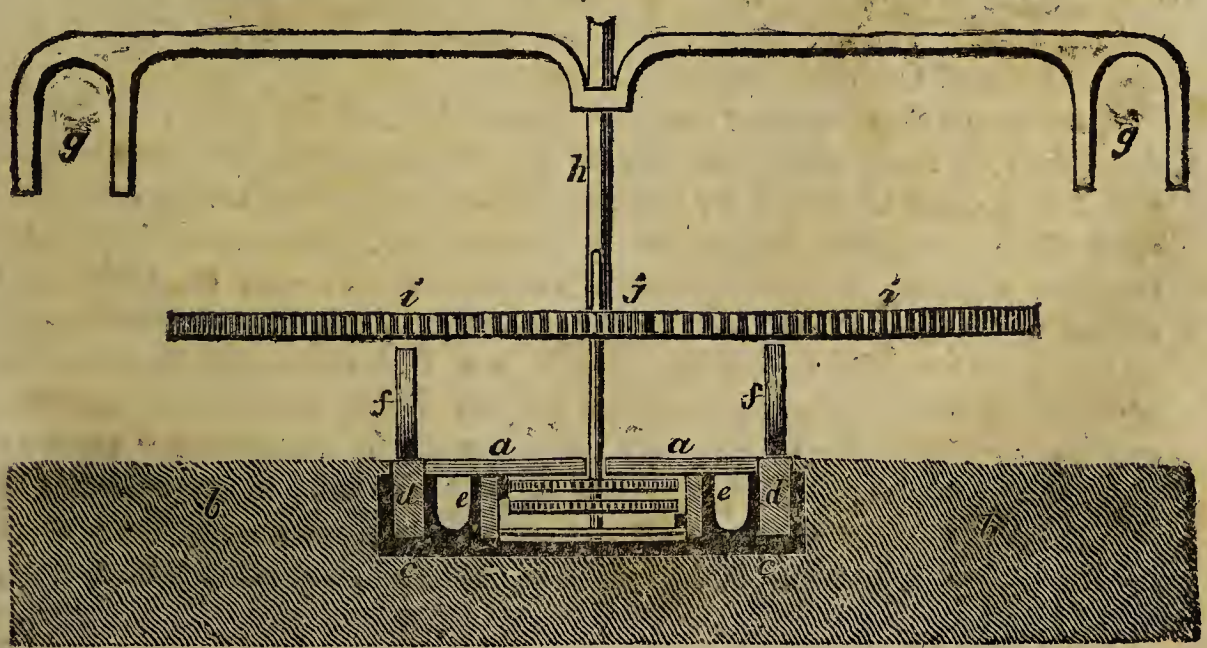
CONTENTS:

Snowden's Patent Wheel-Ways and Carriages, ... 194
Vallance on Ventilation, ... 196
Spilsbury's Patent Process in Tanning) .. 200
The Process of Manufacturing Cobalt-blue, 203
On the Transportation of Fish from Salt to Fresh Water, ... 205
Miscellaneous.—Strength of Leaden Pipes 206. Preservative against Rust, 207.—German Anti-attrition Preparation, ib.—Method of curing Smoky Chimnies, ib.—Improvements in Light Houses. ib—New Patents, 208—and Correspondents. ib,





SNOWDEN'S PATENT WHEEL-WAYS & CARRIAGES.

SNOWDEN'S PATENT WHEEL-WAYS AND CARRIAGES.

The invention delineated in our frontispiece will we doubt not excite the surprise of our readers; and extraordinary as it may appear at first sight, we think it not undeserving of their attentive consideration.

The idea of employing horses to propel a carriage by travelling and exerting their strength within it, seems to be a totally new idea, and the merit which may belong to it is solely due to Mr. Wm. F. Snowden, of Oxford Street, who has taken out a patent for the invention. The reason assigned by that ingenious mechanist for employing horses in this peculiar manner, is, that they cannot exert their natural strength with so much effect in any other way, at present known; that is, so as to be able to draw or propel *a heavy weight with an equal degree of speed.* His argument we will endeavour to state, after having described the wheel-way upon which the carriages are proposed to travel.

At *b b* is shewn a vertical cross section of the road, in which an excavation is made, and the ground well rammed, so as to lay down at stated regular distances a series of cast-iron frame pieces or sleepers *c c* (represented in the figure quite black). In the several partitions of these iron sleepers are placed lengthwise of the road, four lines of timber, end to end, uniformly breaking the joints, as it is termed; or so, that the joints in any one line shall not be opposite to those of another. The two principal rails, those shewn at *d d* are of oak, and of a sufficient depth to stand about three inches above the level of the other parts when bedded in the iron sleepers. The other two lines of timber *e e* are 3-inch deal planks set up edgewise, and bolted to the iron framing. Resting upon these deal planks and the iron partitions, and flush with the oak timbers are laid, crosswise of the road, short pieces of 3-inch oak plank, leaving an open space or crevice about 1½ inch wide between them: these short planks are laid edge to edge uniformly along the whole line, forming with the oak timbers a regular level floor upon very solid bearings; and over this floor is screwed down a complete covering of wrought-iron plates *a a* as they come prepared from the rolling mill. Thus is made, a hard, smooth, and firm surface for the wheels of the carriage to roll upon.

Inside of the trunk or hollow space formed by the wheel-way described, a small machine called by the patentee, his *mechanical horse* is caused to travel by the motive force applied above; it consists of an iron frame-work, to which are attached certain horizontal toothed wheels, revolving upon vertical axles, one of which (as occasion may require) is put into gear with a straight horizontal rack, fixed on either side to the deal planks *e e*, and extending their whole length. These horizontal toothed wheels being actuated by a steam engine, or any other first mover will necessarily cause the "mechanical horse" to move forward in the trunk over a space equal in length to the circumference of the wheel at each revolution; and consequently whatever is connected thereto above the wheel-way,

must go along with it. The connection is effected by standards fixed in the mechanical horse, which pass through the opening in the wheel-way, and are attached to the middle of the carriage; the weight of the carriage is not however supported by the standards but rests entirely upon the ordinary wheels, which thus relieves the toothed wheels and rack of an immense quantity of friction, and allows them to act freely and unimpeded by the weight above.

But two toothed wheels are shewn in the hollow trunk of the wheel-way; there is however another which cannot be seen in this view, which when put into gear with the opposite rack reverses the rotary motion, and causes the carriage to proceed in the same direction: the manner in which this is effected, by gearing of the kind, is too generally understood to need further description. The lowest wheel of the three is made light and without teeth, being employed as an anti-friction roller, and to keep the toothed wheel uniformly in the pitch line of the rack; it therefore occupies the whole space between the two 3-inch deals.

In ascending or descending a hill the floor of the carriage is preserved in its horizontal position, that the horses may not be impeded in their work, by being placed on an inclined plane: for this purpose there are two elevating screws *s s*, which are so contrived with joints, that an attendant operating upon one of them raises one end and depresses the other, as the whole body of the carriage is made to turn on the horizontal shaft *t* and *u* resting upon strong bearings, and the whole braced together by a suitable frame work.

If a steam engine were to be employed as a motive force instead of horses, all that would be requisite would be to attach to the vertical shaft which carries the horizontal toothed wheel (shewn in gear in the trunk), a spur wheel and pinion, and to connect the crank of the engine thereto. Now if the steam engine thus employed be of the power of two horses, it will have to be carried along with the load, and its weight will be added thereto. Then, it is argued, if it be desirable to carry the steam engine, why not carry the same power, in the form of horses which would be of less weight than all the apparatus of the former; and passengers generally, it is presumed, would give the preference to the company of horses as travelling companions, to that of a steam engine boiler. It is true, that as the horses have to move in a circle, a clear space of about sixteen feet wide would be required for such a carriage to travel in, but as the road would be adapted to the carriage, that difficulty is considered to be obviated.

The patentee calculates the power of an average horse in drawing a load at the rate of $2\frac{1}{2}$ miles per hour for four hours a day, as equal to a force of about 250lbs. when drawing in a straight line; if the speed of the horse be doubled, that is, 5 miles an hour, the force he can apply is not more than 50lbs.; and if it be increased to 10 miles per hour, the horse can do no work whatever, except during a very short space of time; $2\frac{1}{2}$ miles per hour is therefore considered the most advantageous pace for a horse to exert his strength in drawing a burthen. As, however, the contracted circle of a mill-walk is unfavourable for the full exertion of a horse's powers, Mr.

Snowden supposes the useful effect to be about 200lbs. Having got this available force, he then proposes to sacrifice three-fourths of it, in order to gain an equivalent in speed; or, in other words, 10 miles an hour, in which the force applied would be but 50lbs. each horse. This will be readily understood on reference to the lower figure in the engraving: *g g* are two yokes (to which the horses are attached) of a horizontal lever, fixed to the main shaft *h*, on which is also fixed (close to the floor of the carriage) the large horizontal toothed wheel *i*, of 12 feet in diameter; the revolution of the large wheel *i*, gives motion to the small pinion *j*, 1 foot in diameter; which pinion being on the same spindle as the toothed wheel, 3 feet in diameter, of the "mechanical horse" (shewn in gear with the rack), causes it necessarily to revolve with a speed quadruple that of the horses; or to pass over a space four times greater in the same time; or at the rate of 10 miles per hour. It now remains to be seen what load can be moved at the rate of 10 miles an hour by the united force of two horses applied as beforementioned, *i.e.* 100lbs. It is presumed that this will amount to 6 or 7 tons upon a level rail-way, and upon reference to Mr. Tredgold's work on rail-roads, we find this to agree very nearly with his statement of the effects produced by this power. The weight of the horses is therefore of trifling consideration, if the advantages attending this novel mode of applying their strength are so immense. We understand that Mr. Snowden has the machinery and apparatus in a very forward state, for giving the project a fair trial, with the results of which we shall take the earliest opportunity of informing our readers.

VALLANCE ON VENTILATION.

As at the present season there are perhaps few topics of more general interest than improvements in the mode of warming and ventilating our dwellings and apartments, we purpose laying before our readers several successive papers, descriptive of the various apparatus employed, or proposed, for effecting these objects, more completely than they have hitherto been. It was our intention to have commenced by a descriptive account of the newly invented stoves by Messrs. Atkins and Marriott, (which are constructed upon the most economic and scientific principles) but the engraved illustrations being incomplete, we defer that subject to our next number, and introduce in lieu of it, some account of Mr. Vallance's patented method and apparatus for ventilating large public bnildings or crowded places of resort, and for the keeping them of an uniform pleasant temperature. In a published "*Letter to the Right Honourable the Earl of Chichester*"* (in which Mr. Vallance has in a very able manner shewn the advantages that would result from the adoption of his plans in the two houses of parliament and other large public buildings) we find the following very clear illustration of the princi-

* Published by Baynes, Paternoster-Row, 1823.

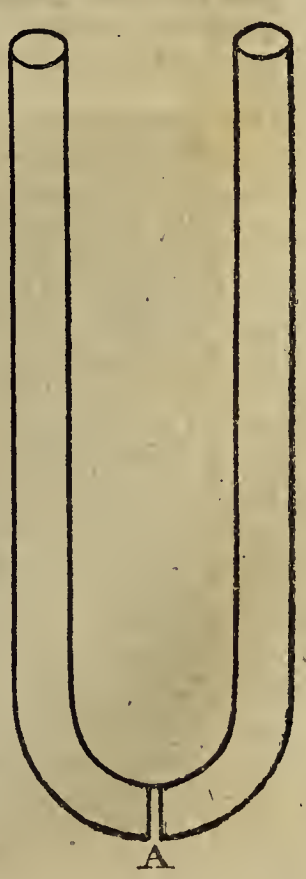
ples upon which those chilling drafts take place so unfavourable to all comfort, and which annoy us in almost every situation in every apartment.—

"There are two principles which operate to alter the state of air, in any place where numbers of people convene. One of them affects it physically, and to a change of density; and is the cause of drafts and influxes of cold air: the other affects it chemically, and to a change of quality, as the medium by which the action of the lungs is rendered efficient to the preservation of life; and renders necessary, and indeed indispensable, the drafts and currents of which the first is the cause. The first of these occurs in every place in which air is heated; the other, only in those places in which it undergoes respiration. Now, it is the first only of these that falls under our consideration, when investigating the principle on which drafts take place; and the course of operation of this principle is thus. If heat be communicated to a particle of air, a change takes place with respect to that particle in the following manner; it becomes expanded and increased in bulk, in some such way as may be conceived by reference to the juvenile practice of holding a flaccid bladder before the fire, to tighten and fill it up again, prior to using it as a football.

"By this expansion it is increased in bulk, but not in weight; and in consequence rises from among the other particles, and ascends towards the ceiling; in the same way that a bladder filled with air would rise through, and swim at the top of others filled with water, were they thrown into the sea together: and, as the only circumstance which caused this particle to be where it chanced to be, at the time this supposed heating took place, was its gravity, the moment that becomes altered, and it, in consequence, rendered specifically lighter than the surrounding particles, it ascends, and passes through them towards the ceiling. This is the course of operation of the principle; the effect of it is this. The moment this particle of air has moved away from what heated it, its place is taken by another, which, undergoing the same change, passes off in like manner, having its place taken by a third particle; and this alternation continues, all the while heat is communicated, be the communicator what it may, whether the human body, a stove, or any other method of heating.

"This is the effect of air's being heated; its physical state is altered, and it becomes specifically lighter than it was before.

"The consequence of its becoming lighter may be conceived thus. If a glass tube were taken, shaped in this manner, with a notch or crevice cut in it at A, to which notch or crevice a metallic slide were well and tightly fitted, so as to cut occasionally off the communication between the two legs; if, into this tube there were (when the slide was pushed in, so as to cut off the communication) poured, in one leg quicksilver, and in the other water, and then, when both were full (placing the thumb on the top of the leg that had the water in to keep it in) the slide between the quicksilver and water were pulled out to let them press one against the other, it is very evident, that the superior weight of the column of quicksilver would cause it to press the column of water upward against the thumb, and that, were the thumb removed, the water would be driven up, and some of it forced out of the tube; and also, that the water would continue to rise, till the contents of the two legs counterbalanced each other. Now, this is an illustration of what takes place in any building, whenever the air inside it is hotter than the air without.



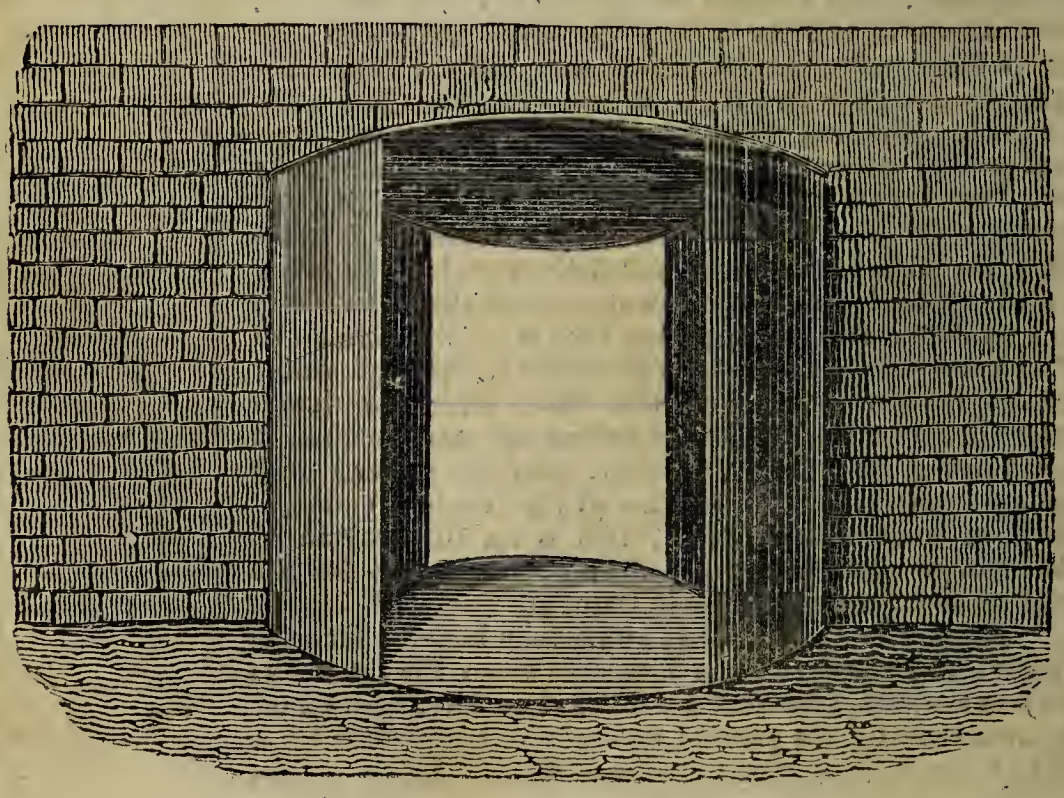
"Since, the external air, being then heavier than the internal air, the former so operates upon the latter, as to press it upward against the ceiling, in the same manner the water would be pressed against the thumb; and if a part of the ceiling be cut away, so as to open a means

of emission similar to what the removal of the thumb permitted; that is, if a ventilation aperture be opened in the ceiling, the superior weight of the cold external air will cause it to drive the lighter internal air up through that aperture, till the equilibrium becomes restored; and if, owing to the air on the inside being, by the respiration, &c. of people convened in the building, kept constantly warmer and lighter than the external air, this equilibrium is prevented, and the difference between the external and internal atmosphere kept permanently up, the consequence then will be, that instead of a single and transitory emission, like that of the water from the tube, there will be a continuous emission of air through the ventilator, all the while the respiration, &c. of those who are assembled in the building, keeps up the difference. Now this is what takes place in all public places; and, as owing to the doors and windows being, during cold weather, kept shut, the aperture of admission (or channel, by which the external air enters the building) is rendered very much smaller than that of emission—to make up for the difference thus caused between the apertures of admission and emission, the cold external air is obliged to make use of all the cracks and crevices that are about either the doors and windows, or elsewhere around the building; and to introduce itself through them, with a velocity so much greater than that at which it passes off by the ventilator, as will make up for the difference between the sizes of the cracks and crevices by which it enters, and that of the ventilation aperture.

"This is the reason why drafts are experienced from the crevices of doors and windows: the heated and respired air passes off by the ventilator; to make up for what so passes off, fresh air flows into the bottom of the building; and as, when the weather is cold enough to make us shut the doors and windows, ingress, by a duct equal to that of egress is prevented, to make up, by the rate at which it enters, for the difference in the sizes of the apertures of admission and emission, the air that finds its way in through cracks and crevices, enters with so great a velocity, as to cause the chilling currents we experience."—

We now annex the remedy proposed by Vallance for these evils.

"Instead of suffering ventilation to take place at the pleasure of the air, I restrict and regulate it thus. I first have the windows of the place nailed down, to prevent them from being ever opened: I then have the joints and crevices, both of these windows and of the room in general, so filled with putty, or so treated with any kind of lute, or luting, that will answer the purpose, as shall prevent their becoming channels, through which drafts or currents may find their way either *into* or *out of* the place. I then have the



door-ways arranged thus. Removing the present doors, the door-way is made six feet wide by about the same height, and into it is fitted a cylinder (of wood or metal) closed at both ends, and placed upright on one of them, so as to appear somewhat like a cask built into the wall. Through the side of this cylinder I have two apertures cut, each about four feet wide by the height of the cylinder inside its ends; which apertures are opposite; the middle of each being in the line of the centre of the cylinder, so as to leave a way of about four feet wide, right through the middle of it into the place, as shewn beneath, where the cylinder is represented placed in the wall, with the apertures in it. In the centre of the cylinder, there is now put (perpendicularly) a shaft, of about three inches diameter, and of the length of the cylinder; and having it, and the centres of the top and bottom of the cylinder, so prepared and fitted to each other, that the shaft may easily turn round or revolve, then there are fixed on it, at right angles to each other, eight arms, or radii, four at top and four at bottom; the bottom four being exactly under the upper ones. To these arms there are fixed four sheets, or pieces of iron plate, of such lengths and widths as will just go into, and fill up (though without touching) the space left between the shaft and the side of the cylinder; and these things being so done, that the plates or leaves fixed on the arms, may turn easily round inside the cylinder; and the inside the cylinder, and the ends and sides of these leaves, being so fitted to each other, that, when the leaves are turned round, there may not be a space greater than about the sixteenth of an inch, left between them, the arrangements for the door-way are complete; and the cylinder, through which the place is entered, has within it four leaves, or wings, somewhat like the fans of a winnowing machine, fixed perpendicularly.

"Now the effect of these arrangements is this. Were a common door to be made use of, whenever it was opened, free egress, or ingress, would be given to air, and it would pass from, or into the place, as circumstances dictated. But, with a door arranged in this way, no air can, at any time, pass either into, or out of the place, excepting by the narrow space, or crevice, left between the edges of the leaves, and the inside the cylinder; since, the leaves being all at right angles with each other, and the two apertures in the cylinder being neither of them so wide, as to be equal to ninety degrees of a circle of the same diameter as this door-way cylinder, it follows, that turn or cause the leaves to revolve in what way we may, two of them will always be within the uncut parts of the cylinder, and constantly interposed, between the inside of the place, and the open air; and, in consequence, there never can be any other passage for air, into, or out of the place, by this door-way, than by the space or crevice, between the edges of the leaves, and the inside the cylinder.

"When the windows and door are thus finished, I proceed as follows with the ventilator. To the aperture in the ceiling, through which ventilation takes place, there is fixed a pipe of an equal diameter with that aperture; which pipe goes through the roof, and then descends and opens into a reservoir, or cistern situated on the outside of the building.

"Now, with things thus arranged, and with the cistern so far filled with water, that the end of the ventilation pipe is immersed a few inches in the water, the machinery, by which the warmed air is injected, is set to work, when air, fresh, and of a temperature pleasant to the feelings, is injected into the bottom of the building at a rate sufficient for the consumption of the people inside. This air, the pipes which convey it in are so contrived and arranged, as to distribute over the whole surface of the floor, in a way which renders its introduction imperceptible; and consequently inconvenience from drafts or currents of it is guarded against. As fast as it is distributed over the floor it gives place to the air that follows it, and rises towards the ventilator. In its ascent it passes the persons of the people in the place; and becoming, from the heat imparted to it by their bodies, and from the deteriorating effects of their respiration, lighter, it rises more rapidly towards the ventilator.

"Now, from the arrangements and lutings I have mentioned, the only places where this air can find egress are through the ventilation pipe, and by the spaces or crevices, between the door-way cylinder, and the leaves that

revolve in it; and these spaces or crevices being, when the cylinder and leaves are well finished and fitted to each other, as almost nothing in comparison with the quantity of air injected, it follows, that the ventilation pipe must be the main channel of exit. But before any air can pass through this pipe, it must displace the water inside that end of it which is immersed in the cistern; to displace this, a slight pressure must be thrown upon it; the causing this pressure will somewhat condense the air in the ventilation pipe; and as this condensation will, owing to that principle of fluids, by which action and reaction are communicated, be reverted, or reflected back upon, and caused to take place with respect to all the air in the building, the whole of it will be somewhat condensed, and, in consequence, the building will have in it a quantity of air greater than it would under common circumstances have, according to the depth to which the end of the ventilation pipe is immersed in the water. Now as this compressed state of the air, and the building's thus having within it more than it would under common circumstances contain, is contrary to the natural tendencies of air, its expansive principle will be exerted, and every crack and crevice about the place will become a channel, to let air *out* instead of *into* it; and, in consequence, drafts *into* the building effectually prevented, owing to every cranny, through which they used to enter, becoming a channel of *egress* instead of *ingress*.

"This is the way in which I prevent and do away with "drafts:" and when the door, and ventilation apparatus (which is, in fact, nothing more than a most sensitive valve, and to which a valve would, under some circumstances, be preferable) are well arranged, and their effect not counteracted, by any of the cracks and crevices which are about rooms, being suffered to remain unluted, or otherwise unstopped, the evil it is intended to remedy will be effectually done away with.

"There is, to be sure, both singularity, and a degree of inconvenience, in a door-way such as I have described; though, by having the pannels of the revolving leaves, of glass, this might be much done away with; and as there is no other equally convenient way of preventing all possibility of annoyance from the door, whenever any one either entered, or went out of the place, it might be submitted to, should common doors not be considered sufficient.

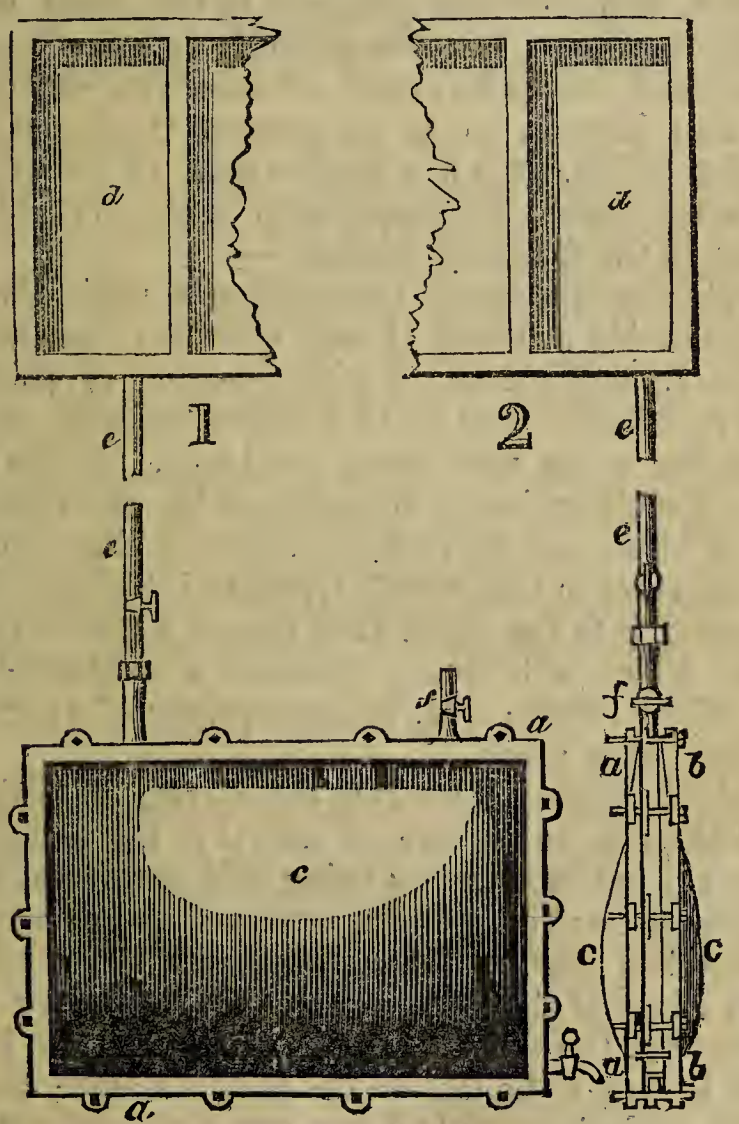
"With the prevention of inconvenience, and the danger of taking cold *inside* the building, would also be the removal of much of the liability to cold, &c. when leaving the now highly heated atmospheres of public places. As, owing to the temperature's being always uniform, and never above that which was agreeable and salubrious, much of the danger we *all* experience, and many of the indispositions people of delicate constitutions incur, in consequence of passing from those atmospheres to the open air, would be done away with. And by varying the depth of the water, in which the end of the ventilation pipe is immersed, according to the variations of the barometer, constant uniformity, as to the density of the atmosphere inside the building, might be maintained."

SPILSBURY'S PATENT PROCESS IN TANNING.

The hides and skins of animals, after having been deprived of the wool, fat, and other extraneous substances, by the usual process of liming (i.e. maceration in lime water), pressing, scraping, &c. are ordinarily tanned by being immersed for a long time in infusions of oak-bark, nut-galls, sumach, or other vegetable substances, that contain an abundance of the astringent matter called *tannin*; which, entering into close combination with the animal substance, takes from it its putrescent quality, renders it insoluble, and converts the gelatine into that fibrous, flexible, and durable material called LEATHER.

When skins are operated upon by *cold* infusions of tannin,

according to the old-fashioned mode, they take a considerable time before they are thoroughly tanned; as the vegetable matter is very slowly absorbed: according to the thickness of the skins they will take from one month to several years before they are penetrated with the tannin in every part. Many successive attempts to shorten the process (particularly by the employment of *warm* infusions) have been made, and although they have succeeded in making tolerably good leather, it is considered by the generality of persons in the trade to be inferior to that produced by the ancient mode, especially as regards that most important property, *flexibility*. From a series of experiments made by Sir Humphrey Davy, that philosopher has also remarked that leather slowly tanned by weak infusions of bark appears to be better in quality, being both softer and stronger than when tanned by strong infusions.



Although complete success has not attended the previous processes, that now proposed by the patentee, (Mr. Francis Gibbon Spilsbury, of Walsall, in Staffordshire) promises the most favourable results. The specification describing the invention is concise and clear; we, therefore, annex it in the original words:—

"My improved method of tanning skins or hides, consists in the application of mechanical force, by means of certain machines or

apparatus, for the purpose of driving the tan liquor or liquors through the skins or hides intended to be tanned.

"The skins or hides, in the usual method of tanning, after they have been prepared by liming, or other well known processes, are immersed in the tan liquor, or liquors. In this situation they absorb, or are penetrated by a portion of the liquor in which they are immersed. This portion having produced on the skin, or hide, its tanning effect, becomes more or less exhausted; and, as long as it remains in the skin or hide, greatly retards the entrance therein of fresh portions of unexhausted tan liquor, and thus protracts, to a very inconvenient length, the tanning process, especially when applied to dense skins or hides.

"My invention consists in the introduction of the tan liquors, by means of mechanical force, into the pores or substance of the skin, or hide; which I effect in the following manner.—The skin, or hide, being cleansed, and otherwise prepared in the usual ways, for the action of the tan liquor, is to be carefully examined, and any holes that may be found, are to be sewed, or otherwise secured, by means which are well known, so as to prevent the liquor from running through; after which, it is in a proper state to be exposed to the action of the tan liquor, in conjunction with mechanical pressure, which I effect in the following manner:—

"I provide three frames, of similar shapes, made of wood, copper, or any other suitable material (I may mention, that the use of iron for this purpose, unless covered with a coating of paint, should be avoided, as its effects would be to blacken the skin, or hide), and furnished at the sides with ears, or loops, for the reception of screw-bolts; the object being, by means of the outer frames, to press two skins, or hides, one on each side, against the middle frame, and through an aperture in this middle frame to introduce the tan liquor, under pressure, into the space thus formed between the two hides: the effect of which will be, to produce a continued filtration or percolation of the liquor; and, in consequence of which, the tanning process rapidly takes place.

"The middle frame differs from the others, in having two pipes let into it at the top, and a cock let into it at the bottom.

"One of the exterior frames being laid flat down, with its inner surface uppermost, a skin, or hide, previously prepared, as aforesaid, is laid or stretched over it; the middle frame is then laid on, taking care that the edges of the skin, or hide, shall be every where griped or nipped between the two frames; a second skin, or hide, prepared as aforesaid, is then to be laid on the middle frame; and, lastly, the other exterior frame is to be laid on; care being taken that the edges of the second skin, or hide, shall be every where griped or nipped between the middle frame, and the last exterior frame. The frames and skins are then to be secured, by means of screw-bolts, entering into screwed holes, in the ears or loops. The frames are then to be raised upright; one of the pipes is to be secured to a pipe communicating with a cistern containing tan liquor; the other pipe is to be left open, for the escape of air, and the cock at the bottom is to be closed. The cock of the pipe communicating with the cistern being

opened, the liquor contained in the cistern will flow down, and will occupy the space between the two skins, or hides, driving out the air. When the liquor has risen into the pipe for the escape of the air, shewing that the space is filled, its cock is to be closed; upon which the tan liquor between the skins, or hides, being subjected to hydrostatic pressure, by means of the communication with the cistern, (and which may be produced, increased, and varied, by methods well known) will be forced through the pores, or substance, of the skins, or hides; and will appear, in the form of dew, or small drops, on their outward surface. The time required for completing the tanning will vary, according to the density of the skins, or hides, the strength of the tan liquor, the amount of the hydrostatic pressure, and other circumstances.

"When the skins, or hides, are found to be tanned, they are to be removed from the frames; and their outer edges, as far as they were squeezed or nipped between the frames, must be pared off; the skins, or hides, are then to be dried, and prepared for market, in the usual manner.

"It is not my intention to claim, under this patent, the exclusive use of the frames, screw-bolts, pipes, or any other article of apparatus herein-mentioned; or the use of any particular kind of tan liquor, or any mode or process of preparing and of finishing the skins, or hides; save and except, the application of the machines or engines herein described, or set forth, or any imitation of them, for the purpose of causing the tan liquors or liquors to pass, by filtration or percolation through skins or hides.

"The apparatus herein-described, for effecting this purpose, is such as I have employed with success, and consider, upon the whole, to be best; but particular local situations, or other circumstances, may render it expedient to change the shape of the frames, or their vertical position, for some other; or to enclose between the middle frames, and either of the exterior ones, two or more skins, or hides, instead of the single one, as above-mentioned.

"*Fig.* 1 is a front view, and *fig* 2 is a side view. The same letters of reference indicate the same parts in each figure. *a a* is one of the exterior frames. *b b* is the other exterior frame. *c c* are two hides, secured between the exterior frames and the middle frame, by means of the screw-bolts. *d* is the cistern, containing the tan liquor. *e* is the pipe through which the tan liquor descends from the cistern into the space or cavity between the two hides; and which will vary in length, according to the amount of hydrostatic pressure intended to be given. *f* is the exit pipe, through which the air escapes, when the liquor is running down through the pipe *e*. *g* is a cock, for the purpose of discharging the liquid between the skins or hides.

THE PROCESS OF MANUFACTURING COBALT-BLUE.

This beautiful colour (which may frequently be substituted with advantage for the more expensive blue, obtained from lapis-lazuli,

called ultra-marine) appears to be, according to Thenard, a compound of alumine, with the oxide of cobalt. In France, this colour is justly called "BLEU DE THENARD," after the name of its celebrated inventor; and the manner of preparing it in that country is given in the *Dictionnaire Technologique*, from which we extract the following.—

"The cobalt ore is composed of cobalt, arsenic, iron, sulphur and a very small quantity of nickel: it is first to be reduced to powder, and calcined in a reverberatory furnace. In operating upon the large scale, it is usual to take advantage of the heat of the furnace, to calcine several fresh portions of the mineral successively, after the first has been withdrawn. During the calcination, it is essential that the material be frequently stirred, so that every part may be exposed as equally as possible to the action of the heat. There should be a good current up the chimney in the furnace in order that all the constituent principles of the mineral may be operated upon, and the volatile products be carried of. The oxide of arsenic is thus disengaged in the form of white vapours as well as sulphurous acid gas in considerable volumes, and the calcination is continued as long as the arsenical vapours are emitted, which may at any time be ascertained by taking a small portion in a ladle out of the furnace, when, if the odour of garlic be not sensible, the arsenic has ceased to be given off. The calcined mineral should then be withdrawn from the furnace, which will be found to consist of a mixture of the oxides of cobalt, iron, and nickel, retaining some arsenic in the state of oxide or acid, and a portion of the mineral still unaltered by the calcination.

"The result of the calcination is now to be slightly boiled in an excess of weak nitrous gas in a glass balloon or matrass. The clear portion of solution thus obtained, is next to be decanted, and evaporated nearly to dryness, in a capsule of porcelain, or what would be better, of platina. This residuum is now to be thrown in boiling water, and filtered to separate the arseniate of iron, (which has precipitated) from the solution. The next operation is to pour into the clear liquor, a solution of sub-phosphate of soda, which, by decomposing the nitrate of cobalt, affords instead of the soluble nitrate of soda, an insoluble phosphate of cobalt, which is thrown down.

"This precipitate (which is of a violet colour, and susceptible of being changed into a rose tint by remaining under water) is to be well washed on a filter, when it is to be collected *whilst in a gelatinous form* in order that it may be mixed in the most uniform manner possible, with eight times its weight of alumine (or the hydrate of alumina) *in the same state*. The mixture being thus carefully made, the tint will become of equal intensity throughout the mass.

"This mixture is next to be spread over smooth plates and dried in a stove; when sufficiently brittle, it is to be reduced to powder, in a mortar, and then exposed to a red heat in a covered crucible for half an hour. The crucible being now opened, the beautiful blue colour will be found to be obtained, which may, in this state, be preserved in glass bottles for use.

"This process will uniformly be successful, if due attention be paid to the precautions given; but above all, it is essential that the alumine

be precipitated from the alum *in the gelatinous form*, by a sufficient excess of ammonia, and that it be well washed with very pure water (such, for instance, as shall be obtained by filtration through charcoal) until thoroughly purified.

"Another method of preparing this colour, is to employ the arseniate of cobalt, instead of the phosphate, observing only to mix with it sixteen times its weight of alumine instead of eight. The arseniate of cobalt is obtained, by preparing a solution of cobalt in the nitric acid in the manner already described, then adding it to a solution of the arseniate of potash as long as the precipitation continues. The exchange between the oxides and the acids of the two salts will take place in the same manner, and the operation will be completed by following, in every respect, the directions previously given."

ON THE TRANSPORTATION OF FISH FROM SALT TO FRESH WATER.

The practicability and advantages attending the preserving of salt water fish in ponds, for maintaining a regular supply to the market, have been demonstrated upon the large scale by a Mr. Arnold, in Guernsey, under the directions of Dr. Mac Culloch. In a late number of the Quarterly Journal of Science, a very interesting communication is inserted from the last mentioned gentleman, which he concludes by reference to the following important fact.

"Lastly, this plan has been recently put to the test under the direction of the writer of this note, in Guernsey, by Mr. Arnold. In a pond of about four acres only, many sea-fish, which will be found in the following list, are now thriving, and all those which have had sufficient time have propagated: all have improved in quality, and many very remarkably. This pond was at first worthless, producing only a few eels; at present it produces a large rent, and can supply the market when the weather prevents the boats from going out. It is remarkable also, that since the introduction of the sea-fish, the eels have multiplied a thousand-fold, so as themselves to produce a considerable revenue. This proves that fish may be fed, merely by bringing different kinds together, as is the case in nature. It may be added that the evidence from this pond is peculiarly satisfactory, as far as relates to the indifference which sea-fish possess as to the quality of the water. Being embanked from the sea, and receiving an insufficient supply of fresh water in summer; it varies so that while it is perfectly fresh in winter, it is nearly salt in very dry weather, and brackish in various degrees at intermediate periods. Here also it is remarkable, that while the larger fishes have been placed there, many of the smaller ones, which formerly shewed no such desire, have introduced themselves through crevices in the sea wall, and that it is in particular crowded with crabs and prawns. It is now necessary to subjoin a list of the fishes which, belonging naturally to the sea, have been found to live in fresh waters. Some of these have been forcibly introduced, others seek it for themselves.

If the list is still limited it is because the rest have not been tried; for no fish, on which the experiment has been properly tried, has failed. When they have failed it is because they were previously injured, or nearly killed in the taking or the transportation."

The *cross* indicates those which have been forcibly naturalized in Mr. Arnold's, or some other pond.

Conger,	*Plaice,	*Atherine,	Mackerel,
Torsk,	Flounder,	*Rockfish,	Herring,
Sprat,	Red Flounder,	*Cuckoo fish,	*Horse Mackerel,
Shad,	White Whale,	*Old Wife,	*Pollock,
Alose,	Cod,	*Sole,	Prawns,
Greater Lamprey,	*Basse,	*Turbot,	Shrimps,
Lesser Lamprey,	Loach,	Sand Eel,	Crabs,
Stickle back,	Red Loach,	Rockling,	*Oysters,
Cottus quadricornis	*Smelt,	Whiting pout,	*Muscles.
Mullet,			

MISCELLANEOUS INVENTIONS,
Discoveries, & Processes in the Useful Arts.

Strength of Leaden Pipes.—Experiments upon this subject have been made at Edinburgh by Mr. Jardine at the Water Company's yard. The method was to close one end of a piece of pipe, and then inject water into it by means of a forcing pump attached to the other end, the face or pressure being measured by a guage belonging to the pump. When the water from the injecting pump begins to press out the pipe, little or no alteration is observed in it for some time. As the operation proceeds, however, the pipe gradually swells throughout its whole length, until at last a small protuberance is observed rising in some weak part, which increases until the substance of the pipe becoming thinner and thinner, is at last rent asunder, when the pipe bursts with a crash, and the water issues with great violence.

In the first experiment, the pipe was of $1\frac{1}{2}$ inch bore, and the metal, which was remarkably soft and ductile, one fifth of an inch in thickness. This sustained a power equivalent to that of a column of water 1000 feet high; equal to 30 atmospheres, or 420lbs. per square inch of internal surface, without alteration, but with a pressure equal to 1200 feet of water it began to swell, and with 1400 feet, or 600lbs. on the square inch it burst. When measured after the experiment it was found to have swelled until of a diameter of $1\frac{3}{4}$ inch. The edges of the fracture were not ragged but smooth and sharp like a knife.

In a second experiment the pipe was two inches in diameter, and one fifth of an inch in thickness. It sustained a pressure equal to that of a column of water 800 feet high, with hardly any swelling, but with 1000 *feet* it bursts. The fracture here was not so fine as in the former instance, the metal being much less ductile. *Caledonian Mercury.*

Preservative against Rust.—The Swedish Ambassador at Paris lately received from the house of Mazet and Co. some propositions to the proprietors of the Swedish iron mines to discover to them a secret of preserving all kinds of iron goods from rust, by means of a metallic composition. The Colleges of Mines and of Commerce, with the Academy of Sciences, and the Delegates of the Iron Office were in consequence directed to examine these propositions, and it is said that they determined to adopt them.

German Anti-attrition preparation.—In our 58th number we gave the English patented process for making this article; it appears that the same composition is used in Germany to diminish the friction of machines, but the proportion of the ingredients are different. A Munich Journal describes the mode of preparation in that country, and gives the results of some experiments made with it, in lubricating the rubbing parts of certain machinery, which tend to prove its decided superiority over oil or grease when used for the same purpose.

Ten and a half parts of pure hogs' lard are to be melted over a moderate fire, when two parts of finely powdered and sifted plumbago ("black lead") are to be added by degrees, and be well stirred with a wooden spatula until the incorporation of the two substances is uniform and complete; the mixture is then to be taken from the fire, and the stirring continued until it is quite cold, to prevent the subsidence of the plumbago.

When this composition was applied by means of a brush in the cold state to the pivots, toothed wheels, &c. of certain iron works, the expense was in consequence found to be reduced from 6 florins, 29 kreutzers (the cost of the oil, tallow, and tar previously used) to 1 florin 30 kreutzers.

Method of curing Smoky Chimnies.—There is a way of building a vent which was found to succeed in the huts which were erected by the British Army in America during the war of the revolution; and even in the underground vents which were built to their tents when out at a late period in the autumn, or rather the beginning of winter. In the writer's own house, where the principal vents were altered upon this plan after the house was finished, and in which there have been fires for nine months, the purity and cleanliness of the rooms sufficiently testify its efficacy; but he has a still farther proof in the testimony borne by Mr. Elliott, who built the house and made the alterations, and who was so convinced of the improvement effected from what he saw, while the vents were damp, that in the two houses which he has since built in Melville Street, Edinburgh, he has constructed all the vents on the same principle. The method is simply to contract the vent as soon as possible, then gradually to widen it for four or five feet, and then again contract it to the usual dimensions, and carry it up in any direction. Register Grates are unnecessary. *New Monthly Magazine.*

Improvements in Light Houses.—Although great improvements have of late years been made through the British dominions upon

Light-houses, yet it is possible to make further progress in so useful and necessary a building. They may be so constructed as not only to ascertain the situation of head-land, harbours, &c. but also to determine the distance the observer may be from them in the following manner, viz. Suppose the Light-house to be erected be of a conical form, the great light at the top may have what tinge it may be thought proper to give it; underneath at a distance of from 100 to 150 or 200 feet, three more smaller lights to be seen a few leagues at sea. So long as these last mentioned are not seen, the observer may conclude that he is at a considerable distance from the light-house; but as soon as any one of them is perceivable, he need only take the angle of altitude between it and the great one, and on a table calculated on purpose before hand, he will find the distance he is from the Light-house by an easy and expeditious method, sufficiently exact for his purpose.—*New Monthly Magazine.*

LIST OF NEW PATENTS.

FLAX-DRESSING.—To Augustus Count de la Garde, of St. James's Square, Pall Mall, for improved machinery in breaking or preparing hemp, flax, &c. Sealed 24th November. Six months.

STEAM ENGINE.—To Joseph Eve, late of the United States of America, but now of Liverpool, for an improved steam engine. 24th November. Six months.

IMPROVED FIDS.—To Henry King, of Norfolk Street, Commercial Road, Middlesex, and William Kingston, of Portsmouth Dock Yard, for improved fids for top-masts, bowsprits, &c. 26th November. Six months.

BEDSTEADS.—To R. J. Tomlinson, of Bristol, for an improved frame-work for bedsteads, and other purposes. 26th November. Six months.

PERFORATED METAL PLATES.—To Marc Lariviere, of Princes Square, Kennington, for improved machinery for perforating metal plates, and for applying the same to various useful purposes. 26th November. Six months.

WHEELED CARRIAGES.—To William Pope, of Ball Alley, Lombard Street, London, for certain improvements in "making, mixing, compounding, improving, or altering the article of Soap." 3d December. Six months.

BOTTLES.—To Henry Bury, of Abchurch Lane, London, for an improved method of securing volatile matters in variously formed vessels. 3d December. Six months.

WOOL-CARDING.—To E. Edmonds, of Bradford, Wilts., for improvements in scribbling and carding machinery. 3d December. Six months.

TO OUR READERS AND CORRESPONDENTS.

Both Letters of TIPTON MECHANIC have been received, and we can assure him it would have afforded us pleasure to have introduced the subjects proposed into our columns, had it been in our power: we shall not however forget his requests whenever the opportunity serves.

We know not how to advise N. B. Perhaps a representation of all the circumstances to the Society, may still have the proper effect. With respect to the publication of the subject in a cotemporary work, it is possible that the expense of the requisite engravings was an obstacle.

Other Correspondents in our next.

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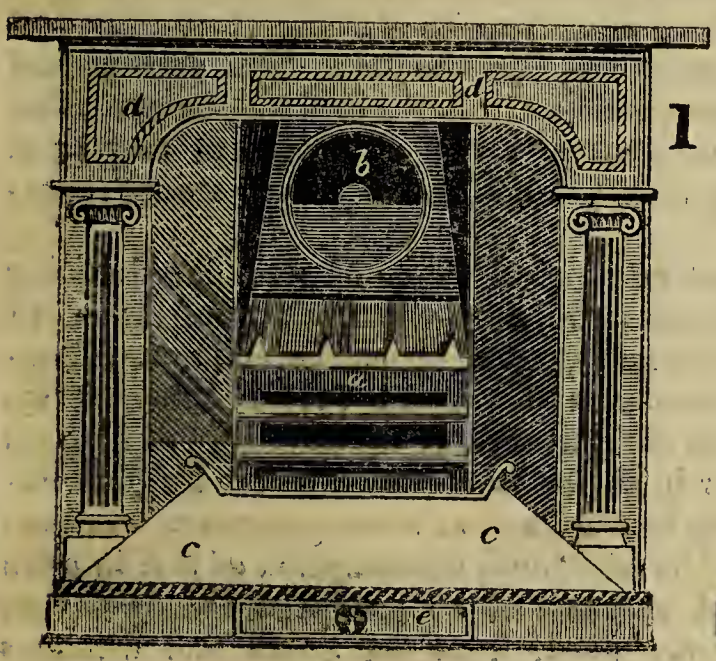
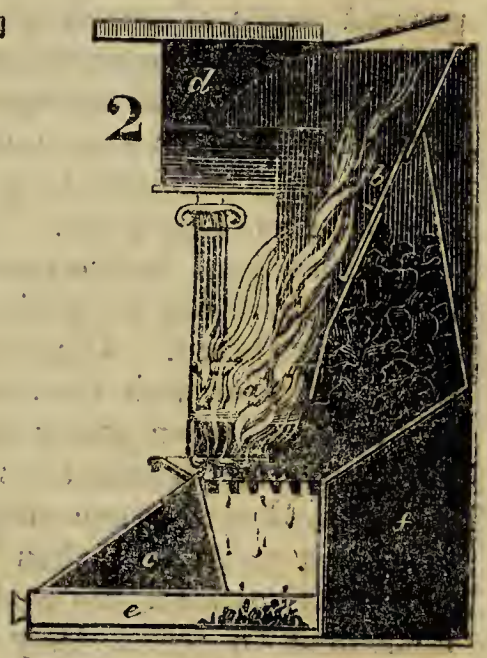
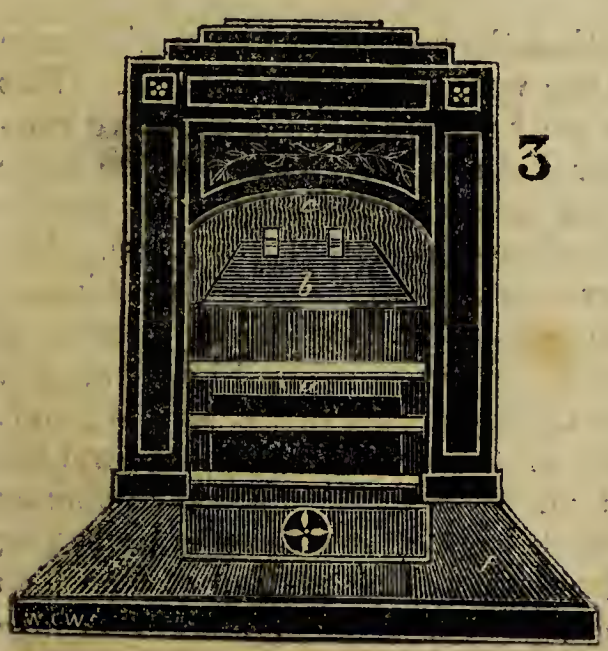
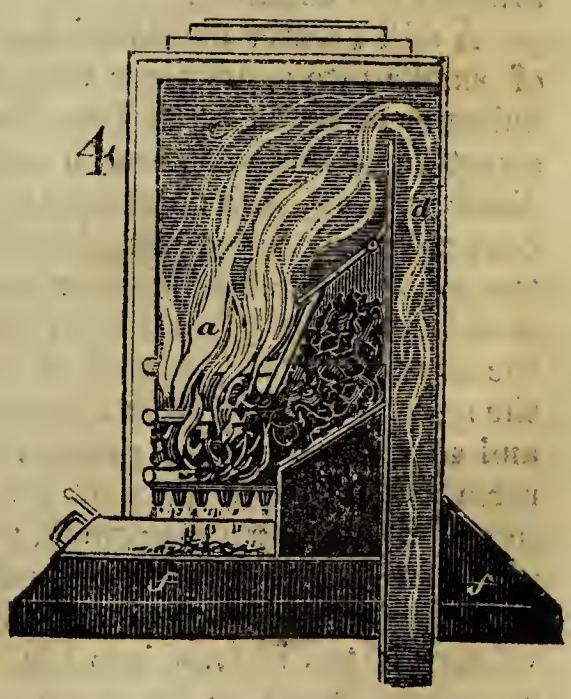
CONTENTS:

Atkins and Marriott's Patent Stoves and Grates 209
Captain Foreman's Patent Rotatory Steam Engine 217
United Power of Fire-extinguishing Engines 218
Ham's Patent Process for making Vinegar 219
Brown's Patent Mode of propelling Vessels in Inland Navigation, ... ib.
New French Weaving Machine. 220
Capt. Symmes's Theory of the Earth being hollow, ... 221
MISCELLANEOUS.—Variation in Composition of the Atmosphere, 222—Inspiration of hydrogen Gas, 223,—The Castor-oil Plant, ib.—Potatoes grown without Light, ib.—Age of the Yew-tree, ib.—Large Trees, 224,—Patents, &c. ib.









ATKINS AND MARRIOTT'S PATENT STOVES AND GRATES.

ATKINS AND MARRIOTT'S PATENT STOVES AND GRATES.

At a period when practical science is making such rapid advancement in almost every department of art, it seems to us extraordinary that the construction of dwelling house chimnies, and their appendages open fire grates, should have engaged so little attention from scientific men. It surely cannot be considered as a point of minor importance to contribute to the improvement of our domestic comforts; and probably no other portion of domestic economy is equally essential to social enjoyments, especially at the present season of the year, as that of a comfortable fire-side.

We shall not trespass on the attention of our readers by enumerating all the disagreeables and inconveniences which result from the present mode of constructing chimnies, as we intend to give the subject farther consideration in a future number. But, with regard to some of the disadvantages resulting from the ordinary construction of dwelling-house stoves or grates, a few observations may be of service, as preliminary to a description of the improved stoves represented in our title page.

With regard to the most economical mode of warming dwelling houses, there can only be one opinion in giving the preference to closed fire stoves. The cheerful aspect of open-fronted stoves, however, together with the abundance of valuable fuel in this country, has rendered open grates an indispensible in the catalogue of English comforts; and it is not our intention to undervalue this English enjoyment, though it can only be obtained at some pecuniary sacrifice.

But a greater evil than the additional consumption of fuel in open grates arises from the cold currents of air produced through every apartment in which they are used, from the doors and windows towards the chimney.

A still greater inconvenience than the preceding is, the discharge of smoke into apartments which are warmed by open stoves. This nuisance arises in cases from the great majority of the defective construction of chimnies, and in order as far as possible to obviate these disadvantages, the aperture at the throat of the chimney is usually contracted by a register plate fitted at the head of the stove. But the application of a register stove as a cure for a smoky chimney is at best only a palliative for the evil, while it adds very greatly to the necessary consumption of fuel. By contracting the opening at the register we doubtless increase the draft immediately at that point, and so far prevent all probability of the smoke returning into the room. But the quantity of cold air which rushes into the chimney in conjunction with the smoke, not only cools the column of ascending air in the flue, but it forces up the chimney that portion of air which is in immediate contact with the front of the stove, instead of permitting it to disperse into the apartment and warm the air. It is, therefore, found to be more economical to employ stoves without register plates, for heating the atmosphere of rooms, provided the flues are properly constructed.

Another defect in stoves of all kinds arises from their being entirely constructed of iron or other metal, which gives out the heat with too much rapidity.

But one of the most important desiderata in the construction of open fire grates, was some arrangement by which the black smoke might be burnt without destroying the uniformity of its appearance. The consumption of smoke has been effected more or less perfectly by several persons in steam engine and other furnaces, some of which have been noticed in our previous numbers. But it remained for the patentees of the present invention to bring this desirable object into effect, and even to add to the exterior uniformity and beauty of the stove at the same time.

The description given of the several improvements in Stoves and Grates by the patentees (Messrs. Atkins and Marriott, of Fleet Street,) in their specification, being too long for our miscellaneous pages, we prefer giving our own abstract of its contents.

The patentees state the objects of their invention to be—first, to afford a remedy for smoky chimnies; and, secondly, to economise fuel and regulate heat evolved from stoves or grates, for warming apartments, and for the various operations of cooking.

To prevent the issue of smoke into rooms, and also to prevent any of the crude smoke from fresh coals from passing up the chimney flue, the smoke is made to pass from a coal chamber behind, through the live coals at the lower part of the grate, previous to ascending the chimney. By this process, all the inflammable portion of the coal becomes consumed, instead of passing up as black smoke, and lining the sides of the chimney in the form of soot, according to the usual system. The flame produced by the inflammable gas adds greatly to the brilliancy of the fire, and, at the same time, serves to increase the draft of the flue so as to carry off the remaining or non-combustible portion of the smoke with rapidity. In order to effect this combustion of the smoke, the coals, instead of being put on the top of the fire, are to be thrown into the coal chamber in the back of the grate, through the semicircular opening at *b*, *fig.* 1, which is closed by a door-plate. At the lower part of this chamber is an opening through the back into the grate, as shewn at *a*; the interior of this box being formed so as to throw the coals forward for supplying the grate when necessary. Although the patentees recommend this rectangular form of coal chamber, they do not confine themselves to that figure in their specification.

Suppose a fire to be kindled in the usual way in the fire bars of this improved stove, unless cinders be used, there will of course be some escape of dense smoke from the lumps of fresh coal employed. But any additional coal that may be required being thrown into the coal chamber, and the door immediately closed, the dense smoke which it evolves is compelled to pass through the body of the fire, by which its grosser particles, or tar vapour, meeting with a supply of oxygen from the air, becomes consumed. The remaining part of the smoke, consisting of carbonic acid gas, and the nitrogen of the

atmosphere passes off rapidly (as a pale ash colour vapour) up the chimney shaft.

The coal box is calculated to hold sufficient coal for a day's consumption, though it would be more economical to throw it on by a single shovel. As the coal becomes reduced to the state of coke, it may be brought forward from the aperture of the coal box, and raised into the grate, as required, by the point of a poker.

The smallest coal may be used in these stoves, from there being no possibility of its running through the grate unconsumed.

The other improvements made by the patentees consist of an appendage, in lieu of a fender, attached to the front and lower part of any kind of stove or grate, which they denominate a "basement."

The exterior of this basement (see *fig.* 1, and its section, *fig.* 2) may be made of any kind of metal plates, or of marble or other stone, or porcelain plates. It may also be made of any figure and any dimensions, according to individual taste or fancy. This basement must be provided with a drawer or box, *e*, to receive the ashes beneath the fire, and with apertures in front to admit air beneath the fire-bars. The whole of the interior of this basement, *c c*, (except the ash box) is filled with a mixture of pulverized charcoal and lime, or any other slow conductor of heat; the patentees not confining themselves to any peculiar materials. The canopy or cornice, *d*, is also filled with similar non-conducting materials. Behind the front plates of the stove on each side of the fire, and also the space marked *f* in *fig.* 2, beneath the coal chamber, are cavities for receiving a portion of the same materials.

The effect of these appendages for retaining that portion of heat which is nearly all lost to the apartment in other stoves, we shall give in the patentees' own words, not having witnessed its operation during the period here mentioned. "If, for example, two stoves be made, one on the usual construction of register stoves, and the other with the improvements before mentioned, and having the fire chambers of equal dimensions; and supposing a fire to be kept in each for a given number of hours, and then extinguished; while the register stove (constructed wholly of iron or other metal) will have become cooled down to the temperature of the air of the apartment within half an hour, the basement and other parts of the improved, or 'Thermo Regulator Stove,' will retain a portion of its heat *from four to six hours*, according to the dimensions of the stove, and its mass of non-conducting materials. The gradual evolution of this caloric from the surface of the improved stove may also be greatly economised for maintaining the warmth of any apartment, by closing the register plate at the top, when the fire is quite extinguished, and by this means prevent the rapid escape of the warm air up the chimney in waste.

"These stoves are also provided with pipes or passages for allowing a column of air to ascend through the basement and upper portion of the stove, which becomes warmed in its passage, and flows out into the apartment at the cornice."

"With the several adaptations and appendages before mentioned,

the improved stove combines the advantages of the close fire chamber stoves generally used on the continent of Europe as to economy and exemption from smoke, with the cheerful aspect and comfort peculiar to open fire grates."

"The draft, or ascending column of air will, in most cases, be sufficient to maintain an active or brisk fire in these improved stoves, owing to the additional heat and rarefaction produced by the combustion of the smoke. But in certain cases, where the bad construction or too great area of chimney flues occasion a remarkably bad draft, the patentees apply a small pipe to the basement of the improved stove, which pipe is to be connected with a reservoir of air (in a kitchen or other convenient apartment) the reservoir to be filled by a pair of lever, or forge bellows; or the air pipe may be immediately connected to the nozzle of the bellows without any reservoir. This arrangement enables a brisk fire to be produced at all times in a few minutes, and without the necessity of having a servant enter the apartment for that purpose."—"This air pipe also furnishes a most convenient mode of supplying any requisite quantity of fresh or cold air, for the purpose of ventilating and cooling apartments during the summer season. For which purpose, the air pipe after it is brought into the corner of the room, is to have a branch leading to the basement of the stove, and another branch carried up and opening near the ceiling; each of these branches to be furnished with a stop-cock to be opened or shut at pleasure. These pipes may be made of any requisite dimensions, and rendered ornamental, or concealed from view, at the discretion of the workmen."

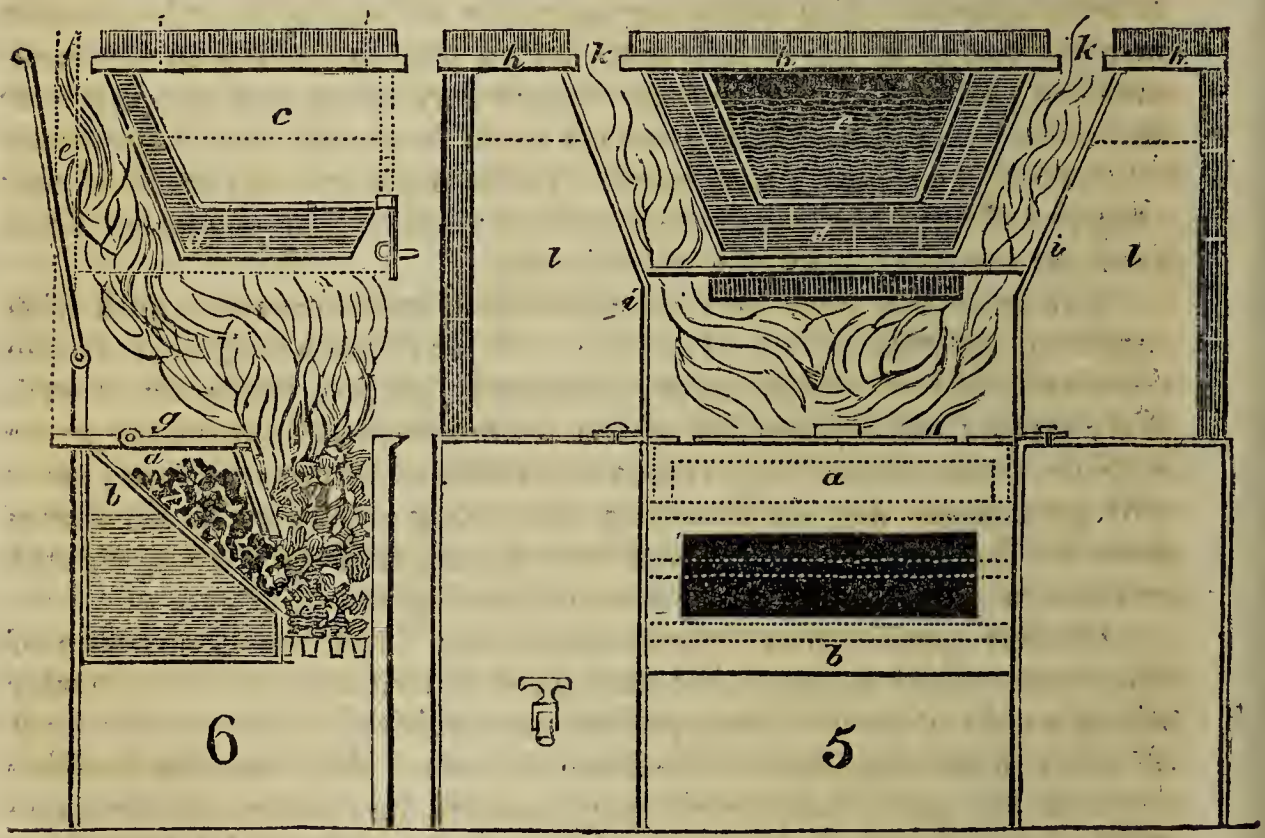
The patentees have also extended their improvements, both with regard to the combustion of smoke, and for economising heat, to the detached Hall or Shop stoves, commonly termed warm-air stoves. We consider the combustion of the crude portion of the smoke to be a point of the utmost importance in stoves of this description; as it will go a great way in obviating the strong objection to air stoves from the flue pipes being so liable to be choaked up with soot, and consequently to endanger the building taking fire.

In their specification the patentees state "that the combustion of the dense smoke destroys full four-fifths of that carbonaceous matter which would otherwise be deposited in the flues or pipes in the form of soot, more especially in horizontal flues. And that the liability to block up such flues must consequently be reduced in the same ratio, from the use of air stoves with these appendages for destroying the opaque smoke." We have not examined the operation of these improved air stoves; but as the principle is exactly similar, and the form of the coal-box or chamber nearly similar to that of the drawing room or register stove, its effects must be precisely the same in destroying the bitumen or crude gas which produce the deposit of soot. The top or lid of the coal chamber in air stoves forms a slope towards the front, and turns back on vertical hinges, as represented in the front view and section, *figs*. 3 and 4. The opening from the coal box into the grate bars is exactly like that of *figs*. 1 and 2. The lower part of these stoves forms a rectangular basement; which is

entirely filled up with the slow-conducting materials before-mentioned; with the exception of the space occupied by the sliding drawer or box for receiving the ashes, and the opening for the flue beneath. The front of this drawer being provided with a sliding ventilator or openings to admit air beneath the fire. The sides of the base slopes gently, so as to afford a convenient resting place for the feet; and from the large mass of slow-conducting materials in the interior, these stoves retain also some portion of their heat for several hours after the fire is quite extinct.

The patentees, in some cases, cover the surface of these stoves with porcelain plates or tiles; which not only preserves a very neat appearance, but serves to render the radiation of heat more gradual and uniform than with stoves made altogether of metal.

Messrs. Atkins and Marriott also apply their coal chamber for receiving fuel and producing the combustion of smoke to Cooking or kitchen stoves. But the arrangements for this purpose shew, in our estimation, even greater ingenuity of combination than in either of the preceding stoves; as will appear from the following description, and a reference to *figs.* 5 and 6.



The coal-chamber is situate behind the fire as in the other grates, but the lid or cover shuts down horizontally; and thus forms a hot plate, on a level with the side-hobs of the range. The bottom of the coal-chamber, however, is made to form the top of a steam boiler *b*, shewn in section *fig.* 6; the front edge of this boiler being in contact with the burning fuel at the lower part of the grate, must receive as much heat as can ever be necessary for raising steam for domestic uses; while the production of steam will serve to protect the boiler from the destructive action of the fire. The boiler is also made to extend round the sides of the fire, if necessary, for raising a larger supply of steam. The coal-chamber and steam-boiler appear thus to

be constructed, so as to obtain the greatest possible effect, both in the production of steam and combustion of smoke, without any sacrifice of convenience, or any extension of bulk in the kitchen range to which it is applied.

But another material improvement has been effected by the patentees in cooking-stoves, by the application of an oven on a novel construction, immediately above the fire.

Notwithstanding the great variety of plans on which ovens have been attached to kitchen grates or ranges, it is generally admitted that none of these plans produce that uniformity of heat which is desirable to maintain for the process of baking. Whenever the oven is placed in the side of the range, it is scarcely possible to preserve uniform heat. Whatever may be the arrangement of the flues for heating the distant parts of such oven, the side next the fire will invariably become too much heated. Whilst another inconvenience (perhaps of no less magnitude) is liable to occur from the blocking up of such flues with soot. How far these disadvantages have been obviated by the patentees in the present invention, we shall leave our readers to form their own opinion; not having had opportunity to witness the operation of their improved kitchen stoves and ovens.

Fig. 5 represents a front view of one of these cooking stoves, consisting of the ordinary form of range in front, with the coal-chamber and steam-boiler as before described. On each side of the hobs at the extremities, and also on the back edge of the range, brick work or tiles are to be carried up about two feet (more or less) leaving an aperture sufficient for the passage of smoke or hot air into the chimney, the aperture being provided with a register plate, as shewn in section *fig.* 6.

On the edges of the hob plates, next the fire, two plates of wrought or cast iron, extending from the front to back, are carried up vertically, and then bent to the right and left till it attains the same level as the brick partitions. These plates are then carried horizontally towards the top of the fire, where they are connected to the sides of an oven, *c*, made of cast or wrought-iron plates bent into the form represented in *fig.* 5, and its section, *fig.* 6. This oven, previous to being fixed, is to be filled to a certain extent with any kind of cement, fire-stone, or clay tiles, (as represented at *d d*, *figs.* 5 and 6) with the view of preventing the too violent action of the fire on the bottom of the oven; and to render the heat uniform in the interior.

The top of this oven is formed by a cast-iron plate extending across the whole breadth of the range, and resting on the edges of the brick partitions. This plate has openings of about 3 inches wide and 15 inches long, as well as the thin plate beneath, for the passage of the hot air or smoke, as shewn at *fig.* 5. The upper surface of this plate is covered with slabs of fire stone, or tile, *h h h*, in order to prevent the escape of heat from the iron plate up the chimney in waste. The spaces, *l l*, serve as auxiliary ovens or hot closets, at the upper part; and the lower parts form inclosed chambers to receive the boiling or steaming vessels that may be placed on the hob, and, if necessary, communicate with the steam boiler below.

The front of these ovens and passages above the range may either

be constructed of iron plate altogether, or of brick work with iron plate doors faced with tile; in order to prevent the waste or radiation of heat into the apartment. The front of the oven extending as far as the front of the grate, thus forming with the brick work at the sides and back of the range a closed chamber, in order to concentrate the heat round the oven. And when the back register plate is shut the whole of the hot air from the top of the fire (and which is nearly all lost in the common range) comes in contact with the bottom and sloping sides of the oven before it can ascend the chimney through the side flues, *k k*.

If the heat be too great beneath the oven, it can be diminished at pleasure by opening the register plate, and allowing the hot air and smoke to pass into the flue at once, and a horizontal plate cuts off this communication when required. It is scarcely necessary to observe that the heat beneath the oven is greatly increased by applying a blower in front of the opening between the top bar of the grate and the bottom of the oven.

In the specification the patentees state "the peculiar advantages attending a kitchen stove having the appendages before-mentioned are, that the oven may be more uniformly and far more economically heated by a given quantity of fuel, than by any of the usual arrangement of flues leading from the sides of the fire; and the very simple construction of the draft passages and apertures, together with the combustion of the crude smoke, in a great measure prevents the inconvenience to which all such flues are liable from the deposit of soot."

The general advantages, therefore, which are contemplated by the patentees in their invention are, that smoky chimnies are almost effectually cured, by consuming the noxious or dense portion of the smoke, and promoting the rapid escape of the remainder;—that chimney flues are much less liable to the deposit of soot than from the use of all other stoves;—that the heat of an apartment will be far more equalized, and drafts of cold air through the room greatly diminished by the use of these stoves;—that in consequence of the additional heat afforded by burning the smoke, by absorbing and economising the caloric instead of allowing it to escape up the chimney, and by the warm air tubes attached to these stoves, the saving of fuel amounts to nearly one half of the quantity necessary for heating an apartment to a given temperature by the usual register stoves."

After the preceding description of the advantages of these stoves, we beg to suggest what we consider its imperfections. It is well known that coal gas requires about ten times its own volume of common air to produce *perfect* combustion. Now we are of opinion, that, owing to the inclosure of the bottom of the fire, there will not be a sufficient supply of air through a small regulator for the perfect inflammation of the smoke. Secondly, as the bottom of the fire comes in actual contact with the basement of the stove, will not the latter be liable to become too much heated for domestic apartments? In all other respects the before-mentioned improvements (both in principle and construction) made by the patentees, in stoves and grates, appear to us unexceptionable.

CAPTAIN FOREMAN'S PATENT ROTATORY STEAM ENGINE.

In the construction of rotatory steam engines much difficulty has been hitherto experienced in obtaining from them any useful permanent effect, owing to the great degree of friction and consequent wearing of the flap valves against the sides of the casing; to keep them, therefore, in an efficient state for working, and to render them steam-tight, such frequent repairs become necessary, as finally to cause a general abandonment of them, and a preference to be given to the ordinary piston and cylinder engines. To surmount the difficulties we have mentioned a variety of modifications have been proposed, and that which we have now to describe appearing to us to be calculated to obviate them in a great measure, we have much satisfaction in laying it before our readers. It is the invention of the scientific Captain Walter Foreman, of Bath; the improvements consist of a new form of casing to the steam wheel, the sides of which are to be conical, or inclined, instead of being parallel to each other; the valves are to partake of the same form; and an anti-friction roller is introduced to close the flap valves as they successively pass under its operation.

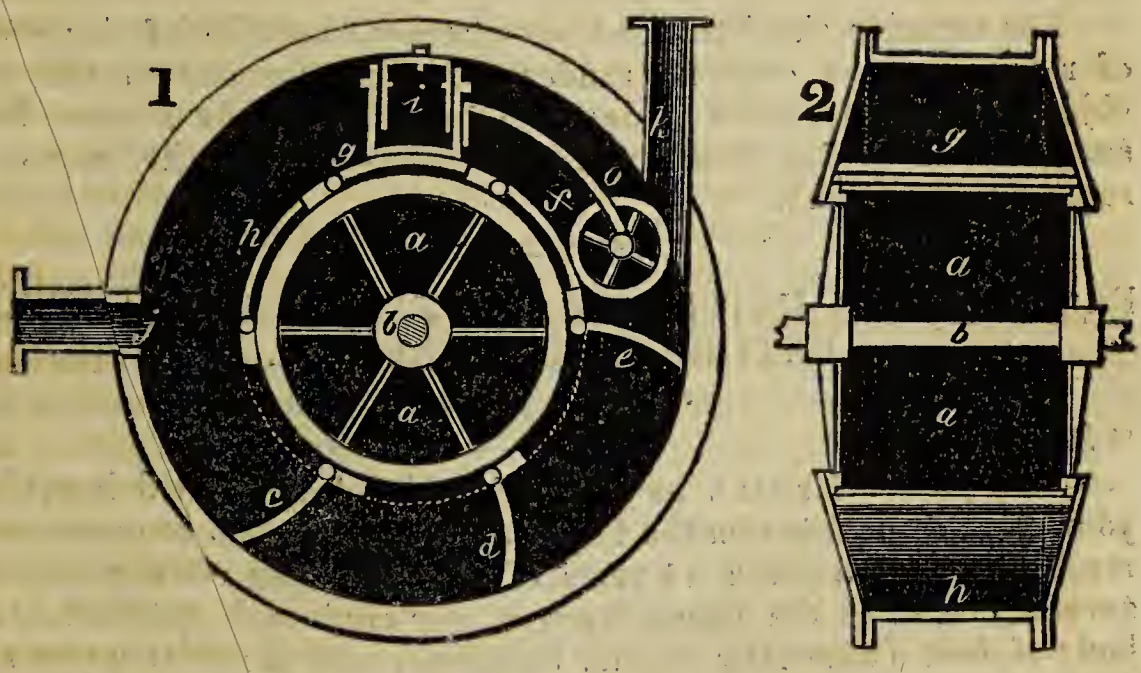


Fig. 1 is a side view of the steam wheel, with the casing removed to shew the situation and construction of the valves, and their mode of action in the steam-way. *a a* is the steam wheel revolving upon its axis *b*. *c d e f g h* are six flap valves, having steam-tight joints, and fixed to six blocks on the periphery of the steam wheel; three of the valves are shown open, and three closed. *i* is a fixed stop for arresting the course of the steam; it is composed of an upper and lower piece accurately fitting the sides of the chamber, and connected together by means of screw bolts, so contrived as to admit of an easy adjustment when the lower curved surface may become worn, by the friction of the periphery of the steam wheel in its revolution. *o* is the anti-friction roller fixed to a springing curved arm, and screwed to the stop *i*.

Fig. 2 is a vertical section of *fig.* 1 through the axis; *a a* the

steam wheel, *b* the axis, *g h* two valves, by which is seen their tapering figure and the conical form of the casing which incloses them; the lower valve is shewn as closing the steam-way, and the upper one as leaving it open. It will now be perceived that the valves from this peculiar shape do not, when moving backwards or forwards, even touch the sides of the casing, consequently all friction in those parts is obviated; the dotted lines in the upper valve are intended to illustrate this observation, as they describe the course of the extreme edge of the valve, when in the act of opening or shutting the steam way.

The mode of operation with this engine is as follows: steam as admitted by the tube *j*, which immediately fills up the space between the stop *i* and the valve *c*, and the latter yielding to the expansive force of the vapour, gives motion to the wheel *a a*; when, in the revolution, the valve *h* takes the place of *c*, the flap of *h* (swinging upon its joint) falls by its gravity into the same position; the steam then acts against it in like manner as *c*, and successively the valves *g f e d* in rotation, as fast as the wheel revolves, the steam finally escaping at the pipe *k*; the friction-roller *o* pressing down each flap, as they pass under its operation against the periphery of the steam wheel.

The superior simplicity and compactness, and the inferior cost, of rotatory steam engines, render every improvement in them an object of most desirable attainment; how far Captain Foreman has succeeded in giving them a practical efficiency we will leave our readers to determine.

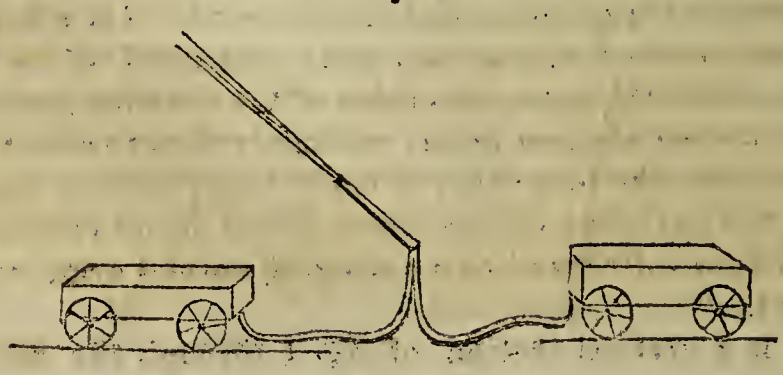
PROPOSAL TO UNITE THE POWER OF SEVERAL FIRE EXTINGUISHING ENGINES.

"*To the Editor.*

"SIR,

"I SHALL be extremely obliged if you will insert in your valuable publication the following communication suggested to me by my son, a youth 14 years of age. Having witnessed upon several occasions the insufficiency of our engines to extinguish a body of fire, (especially in lofty buildings, and particularly that at the shot manufactory, recently consumed) led to the following idea.

"He proposes the united power of two or more engines by a given length of hose meeting at a point, and there discharging the whole of their water into another hose of larger dimensions, with a branch attached to it, as shewn by the annexed drawing.



"Now, Sir, I am of opinion that the same power divided (though feeble in itself) would, when combined in this way, produce wonders. If you think this worthy of insertion, You will much oblige

"16, *George Street,* "Your Constant Reader,
"*Shoreditch.* "E. W."

HAM'S PATENT PROCESS FOR MANUFACTURING VINEGAR.

In the new process for making Vinegar the patentee (Mr. John Ham, of West Coke, Somersetshire,) appears to have availed himself very judiciously of a method employed on the Continent for the preparation of salt. At Bex, in Germany, this same process has been adopted for concentrating solutions of salt for several years past; the brine is there pumped up to the height of nine or ten yards, and made to fall on piles of thorn faggots built up in the shape of a wall; being in this manner distributed uniformly over a very extended surface by means of troughs, it becomes minutely divided in its descent, and the air having free access to every part, a considerable evaporation takes place. The same water is frequently pumped up and distributed over the faggots twenty times or more, before it is brought to the required degree of concentration.*

We have now described Mr. Ham's method of making Vinegar, as the operations are the same, though the effects are different, in consequence of the difference of the liquids exposed to the action of the atmosphere.

In making salt evaporation is the object, and it is thus attained. In making vinegar the object is the acetifying of the fermented liquor, which is effected by its imbibing the oxygen of the atmosphere, by exposure in a minutely divided state: the evaporation that takes place at the same time is of no consequence, as the acid is only the more concentrated, and water is plenty.

CAPTAIN SAMUEL BROWN'S PATENTED METHOD

Of propelling Vessels employed in Inland Navigation.

This invention consists in laying a chain along the bottom of a river, canal, or lake, and making the ends fast at the extremities of the piece of water. The chain is not stretched tightly, but lies sufficiently slack on the bottom, to be taken up with facility and thrown over the periphery of a vertical wheel, fixed in front of the head of the vessel to be propelled; to this wheel a rotary motion is communicated by the impulse of a steam engine, or other convenient prime mover, which causes the chain to be drawn up on one side of

* The mode of preparing salt is conducted in Germany on the most extensive scale; the piles of faggots are usually about five yards thick, and frequently more than four hundred yards long, the whole of which is sheltered from the rain by a roof. The operation being termed *graduating*, these vast erections are called *graduation houses.*

the wheel, and let down on the other side; the grooves in which the chain works being made in such an acute angle, as to prevent the chain from slipping round the wheel as it revolves: the vessel is in consequence propelled with the same velocity as the wheel is turned by the engine.

The most obvious and simple mode of communicating the power and the rotary motion is, by means of an endless band, or chain, embracing the peripheries of two wheels; one of which is connected to the crank of the engine, and the other fixed to the shaft which carries the river chain wheel before mentioned.

A vessel, thus propelled, may be made to tow a train of boats after it, and two sets of boats may proceed by the same chain in opposite directions, one of them shifting the chain whilst the other passes; and to prevent any contention which party should resign the chain for the time, regulations should be made as compulsory as those which determine the right side of a road in travelling upon land. If there be a current, those boats which are proceeding against it should of course retain the chain: but these points are easily arranged.

The dangerous agitations and swells occasioned by the paddle-wheels of steam boats would by this contrivance be avoided, and it affords a facile and certain method of proceeding against the most rapid currents. The invention is exceedingly simple, and the advantages attending it unquestionable in many situations.

NEW FRENCH WEAVING MACHINE.

M. Augustin Coront, of Lyons, has just invented an admirable machine, by which a single workman can conduct six rotatory looms, and weave silk, cotton, flax, hemp, and wool, into plain, or figured, stuffs, with a celerity and perfection hitherto unknown. This skilful mechanic has conceived the idea of two looms, which, by their combinations, and the adaptation of two pieces, form a third. The first has already been used in the fabrication of crape, of seven-eighths taffetas, of three-quarters calicos; the second in making figured stuffs; and the third, set up as a five-fourth machine, two pieces of half-ell-wide, each divided by a separate shuttle. All the accessories are applicable to these looms, and are set in motion by the hand, by alternately pushing the clapper, which is on wheels, and works horizontally. It receives its motion from a pulley, with a twisted leather strap, and two springs placed on each side of the loom. It is capable of being applied to an infinite variety of purposes. When it is wished to make a strong stuff, such as ticking, or thick grained cloth, the clapper strikes the wool twice each time it passes. In proportion as it is wished that the stuff should be open or close, slight or strong, the clapper strikes slightly or heavily, slowly or quickly, and the precise strength is controlled by a regulator. A hand-screw, and a small mallet, suffice to operate these changes. The shuttle, placed in boxes, which it does not quit, except by the

impulse of the workman, passes in the chain from 80 to 100 times in a minute, from the time the machine is set in motion. Another advantage is, that the shuttle has a twofold operation, of a nature hitherto totally unknown, so that it can be varied without trouble or delay, according to the unequal strength of the zones and the stuff; and notwithstanding the extreme velocity of both clapper and shuttle, the loom can be stopped at will without injury. While the parts stop which serve to fabricate one of the pieces in a loom arranged for 6-4, those of the second stop also. This is an inconvenience which Mr. Augustin Coront will in time be enabled to obviate, by making each piece of mechanism of a texture independant of the other; but these short intervals are made up for by the rapidity of simultaneous execution of two pieces. This is nothing compared to the time lost by the workmen in common looms, in disentangling and tying the threads.

M. Coront has taken out a *brevet d'invention* and a *brevet de perfectionnement* for the triple loom. Thus the right of selling, or of manufacturing, belongs exclusively to him; nevertheless, with the view of spreading the advantages of this useful discovery, he offers to furnish for 150fr. (6*l.*) a loom in wood, comprising all the useful combinations of which it is susceptible, on condition of receiving, as a reward for the propagation of his invention, the sum of 70fr. per loom for the right of manufacturing twenty-five; 60fr. for fifty; and 50fr. for one hundred.

SYMMES'S THEORY OF THE EARTH BEING HOLLOW.

Since Captain Symmes promulgated his new theory of the form of the earth, we understand that the question, whether it be a solid or a hollow body which we inhabit, has been seriously entertained by many philosophers of note. As some of our readers may not yet have heard anything of this novel and curious hypothesis, we think it not amiss to give a few particulars which we gather from the Wheeling (U. S.) Gazette.

Capt. Symmes supposes the earth to be hollow, with two openings into the interior, one towards the north pole, about 4150 miles, and the other towards the south about 6000 miles in diameter, the openings commencing at the verges where the earth is known to depart from the spherical figure.

"The shape of the earth at the verge, independently of its high latitude, he argues, is the cause of intense cold, for the same reasons that elevated situations, in any part of the world, are the coldest; and the temperature of the atmosphere in all parts of the earth equidistant from the verge, will be the same: hence we find the climate in England correspond to the climate in the state of New York, both being about the same distance from the verge. Whereas, if the earth was a spheroid, as is generally supposed, the heat would be in proportion to the distance from the equator, which, it is well-known, is not the case. Many other phenomena of nature, hitherto considered inexplicable, are satisfactorily and rationally accounted for, by

supposing the earth hollow within; for instance, the aurora borealis, the variation and dip of the needle, and others which we will presently mention. Navigators, in high latitudes, have frequently found the log-lines and celestial observations to indicate a curvature of the earth, which they thought it impossible they could have passed over, and at other times they sailed an astonishing distance before they gained the natural curvature. If we suppose they were sailing in the first instance on the verge, and in the second around it, the solution will be easy. In the same region objects have been seen 130 miles or more, and the sun has appeared to Barrants and others, many days before his astronomical time: these phenomena have been accounted for on the principles of refraction, but the new theory affords an explanation far more satisfactory."

Many curious facts, such as the migration of animals to and from the arctic regions are brought to bear strongly in favour of the new theory; and a forcible confirmation of it is drawn from a telescopic view of some of the planets. Capt. Parry relates, that when in the northern regions, on the 21st December, the twilight was so great that he could see to read the smallest print with ease. The sun was then the farthest from him; the moon's declination was 15 degrees, consequently below the horizon, and it was likewise so cloudy that very few stars could be seen. He mentions, particularly, that when reading, *he turned his face towards the south.* The advocates for the new theory, believe that the light must have come through the polar opening.

Capt. Symmes believes, that navigators and travellers have been nearly or quite beyond the verge. In the year 1770, Mr. Herne, an officer of the Hudson's Bay company, was sent to prosecute discoveries in the north-west. He passed through a cold barren country, where he found game exceedingly scarce, and suffered many hardships. From the mouth of Copper-mine river he turned his course in that direction, which, according to the new theory, must have led into the interior world, and after travelling a considerable distance in that direction, he found a more hospitable clime, a country where game of all descriptions was abundant, where the soil was rich and loamy, and covered with timber of the largest growth.

In the course of the lectures, it was plainly demonstrated, that the new theory does not suffer for want of light and heat, but is highly favoured with both.

These few facts and arguments adduced in favour of the new theory, are sufficient to shew that it has more plausibility than is generally supposed, and that it has not emanated from a disordered imagination.

Discoveries, & Processes in the Useful Arts.

Variations in the composition of the Atmosphere.—Mr. Dalton states that he has found the oxygen in the atmosphere vary from 20·7 per cent. to 21·15 per cent. The latter was the case on

the 8th of January 1825, the barometer being 30·9 wind N. E. and very moderate, after three days of calm and gentle post. The general state of the atmosphere yields only 20·7 or 20·8 per cent. of oxygen. *Ann. Phil.*

Inspiration of Hydrogen Gas.—In consequence of the difference of opinion entertained by Scheele, Fontana, and others, the following experiment by Giacomo Cardone was made upon himself. Having expelled the air as much as possible from the lungs, he drew into them at two inspirations 30 cubical inches of the gas from a bladder. A difficulty of respiration, and a distressing constriction at the mouth of the stomach immediately ensued; then were followed by abundant perspiration, a general tremor over the whole body, seeming to commence at the knees; an extraordinary sense of heat; slight nausea and violent head ache; indistinct vision; deep murmuring sounds in the ears. After a short time, all these effects ceased, except that of heat, which increased in an alarming manner, but, ultimately, by the abundant use of cold drinks, he was restored to his original health. Giornaledi Fisica. *(From the Quarterly Journal of Sciences.)*

The Castor-oil Plant (Palma Christi) is indigenous to Southern Africa, and is found in abundance in most parts of this colony. It may be useful to some persons in remote situations to know that the safe and valuable medicine which this plant produces is readily obtained by the following simple process:—The ripe seeds are cleared from the husks well stamped in a mortar, and then boiled in water till the oil rises to the surface. This is carefully skimmed off; but as some water will be still mixed with the oil, it is necessary to boil it over again in an iron pot until the water be thoroughly expelled by evaporation. This method of obtaining castor-oil is practised with perfect success by the Moravian missionaries at Gnadonthal, who also use, indiscriminately, the seeds of the different varieties of the plant found in that vicinity, without perceiving any difference in the quality of the oil.—*South African Advertizer.*

Growing Potatoes in the dark!—*Le Mercure de la Souabe* gives the following particulars of an experiment made of growing potatoes in a dark underground apartment.—"I covered a corner of my cellar with a bed of earth, about an inch thick, of which two thirds were fine sand, from the Danube; upon this surface, in the month of April, I carelessly scattered thirty-two thin skinned yellow potatoes: they sprouted out abundantly on every side, and without any culture whatever in the interim, I gathered in November more than a quarter of a bushel of most excellent potatoes, half of which were of the size of pippins, and the others as large as the finest cherries. The skins were very thin, the pulp white and farinaceous, and the taste agreeable; and they were thus obtained at maturity without either sun or light."

Age of the Yew-Tree.—In the original charter for building the church of Peronne, in Picardy (now the department of the

Somme) dated in the year 634, a clause was inserted, directing the proper preservation of a yew tree, which was in existence in 1790, about 1150 years after this notice of it in the charter.—*Monthly Magazine.*

LARGE TREES.—New Zealand is found to produce some of the finest timber trees in the world. The Cowrie grows from 140 to 200 feet high, without a branch at from 80 to 100 feet from the ground; the stems are perfectly straight and from five to nine feet in diameter; it yields a pure limpid resin which quickly hardens in the air, and is equal to the best copal varnish; it delights in dry, elevated situations, and forms a prominent object in the New Zealand forest towering above all other trees. There is another tree, which flourishes in low marshy ground, called the kakaterre, in size it is equal to the cowrie, but the quality of the timber is inferior.

LIST OF NEW PATENTS.

GUN BARRELS.—To John Beever, of Manchester, for an improved gun barrel. 3rd Dec. Six months.

OIL AND OIL GAS.—To Edmund Lacombe, of East Stonehouse, Devon, for a mode of preparing a vegetable oil, and applying the same to the manufacture of gas for illumination. 6th Dec. Six months.

CEMENT.—To J. P. Bevan, of Clifford Street, Middlesex, for a new cement for building and other purposes. 7th Dec. six months.

STEAM MACHINERY.—To F. Halliday, of Ham, Surrey, for improvements in machinery to be acted upon by steam. 9th Dec. six months.

WIRE CARDS.—To J. C. Dyer, of Manchester, for improvements in machinery for making wire cards and in the preparation of the leather used therein. 9th Dec. six months.

PROPELLING CARRIAGES.—To Robert Addams, of Theresa Terrace, Hammersmith, for a new method of propelling carriages over railways, or the common road. 14th Dec. six months.

COTTON PRINTING.—To M. Ferris, of Longford, Middlesex, for improved presses for printing cotton and other fabrics. 14th Dec. six months.

LEAKY SHIPS.—To. J. A. Tabor, of Jewin Street, London, for a means of indicating the depth of water in ships and vessels. 14th Dec. two months.

TO OUR READERS AND CORRESPONDENTS.

J.—W———m's letter was not *received by us* until after our last number had gone to press. He will preceive that we had anticipated his wishes in part, and we shall take pleasure in meeting them to their full extent. The pamphlet alluded to, we cannot lay our hands upon, to ascertain the publisher's name, but that information he will, probably, be able to obtain through the medium of his bookseller.

We assure R. N. that we will not allow the Register of Arts to be made a vehicle for personal attack. The scientific information contained in his communication would have been deemed by us a real acquisition, were it not for the satire and invective with which it is mixed up.

We have received several Letters since the completion of the present Number, which will be separately noticed in our next.

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REGISTER

OF

THE ARTS AND SCIENCES.

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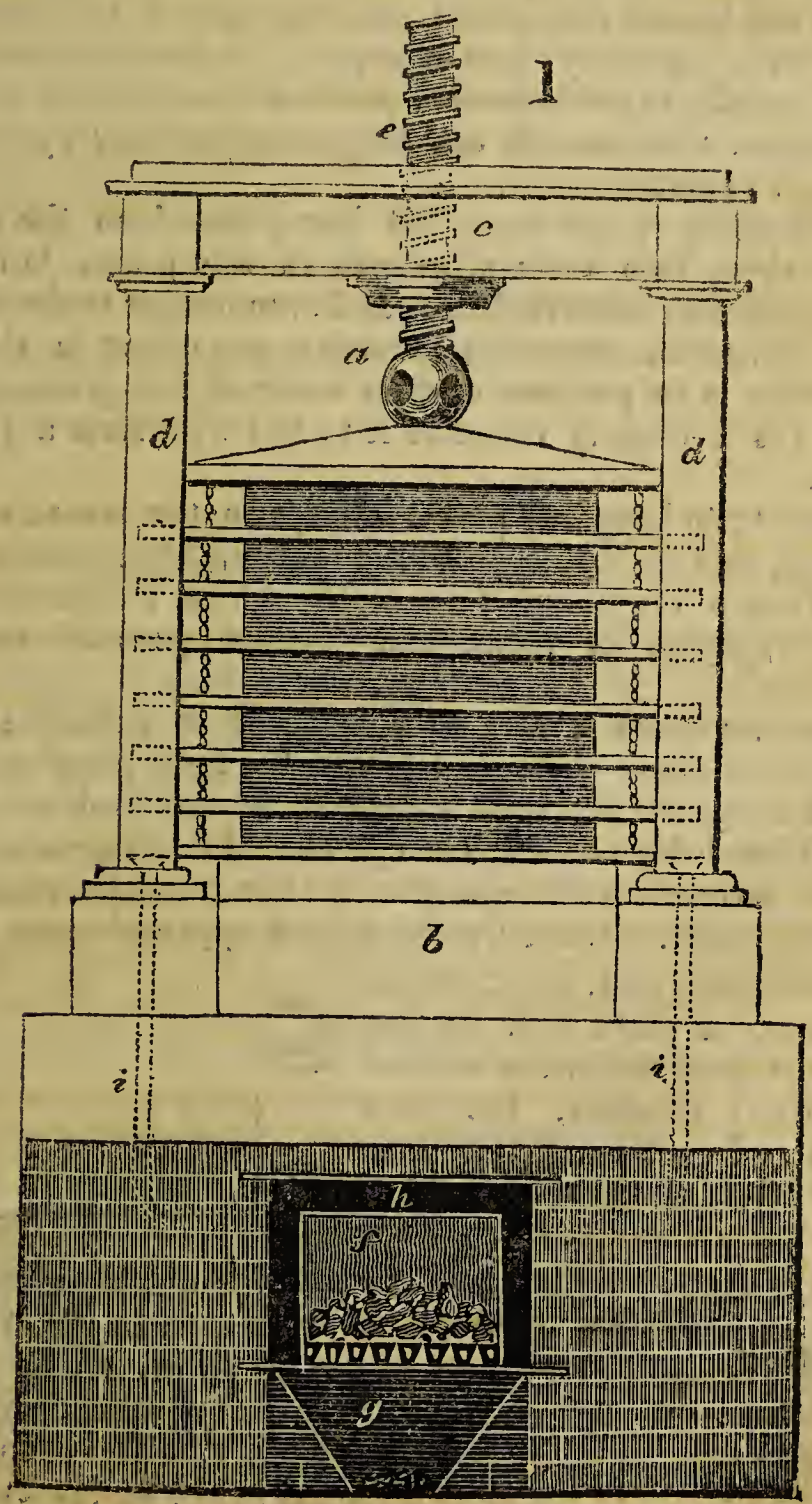
CONTENTS:

New Mode of Hot-Pressing 225
New Material for Rail-Roads 227
Moore's Patent Steam Engine Boilers... 228
Snowden's Wheel-Ways and Carriages .. ib.
Atkins' and Marriott's Patent Stoves 230
Patent Chalk Bricks..... ib.
Roberts's Safety Hood ..... ib.
Thompson and Burr's Patent Revolving Steam Boilers 233
Ramage's Large Reflecting Telescope.... ib.
History of the Steam Engine, Chap. I .. 234
The Pantochronometer, 239—Meteoric Stone, ib.—Letters of Enquiry ..... ib.
Patents, Correspondence, &c. 240



NEW MODE OF HOT-PRESSING.

NEW MODE OF HOT-PRESSING.

" *To the Editor.*

" Sir,

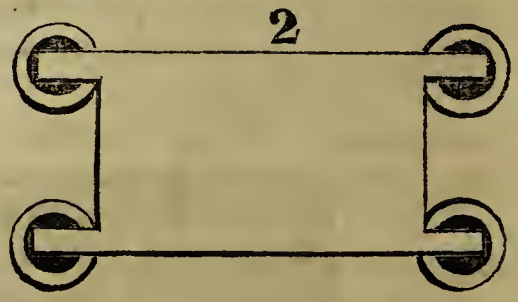
The hot-pressing of paper, linen, and other fabrics, consists in employing heat in conjunction with great mechanical pressure; by which means a smooth and glossy surface is produced upon the goods. The mode of operating, is to heat a number of stout cast-iron plates in an oven, constructed for the purpose; these plates are taken out when of a proper temperature, and put into a screw press in alternate layers with the goods to be pressed, in the manner shewn in the preceding cut; and when paper is the material to be hot-pressed, in addition to the heated iron plates, a highly glazed mill-board is put alternately between every sheet of paper; the hard polished surfaces of the mill boards, in consequence, produce upon the soft and spongy sheets of paper, that smooth and elegant appearance by which hot-pressed paper is distinguished.

" The drawing of the heavy hot iron plates from the oven, and the lifting them into their situations in the press, is a work of considerable labour, inconvenience, and even danger to the workmen; and it is likewise an expensive process; my object in the present communication is to propose another mode of hot-pressing, which, if effectual (as I humbly conceive it to be) will form a remedy for these evils.

" I propose to keep my plates always in the press, whether in action or not, and to heat them to the required temperature by means of hot air from a very small furnace, by which I hope to save fuel, time, labour, space or room, and prevent personal danger and inconvenience.

" My screw press *a* may be considered in principle as of the ordinary construction. The bed *b*, and the head piece *c*, are to be of the most tenacious and solid materials, braced and held together by four cast iron hollow columns or cylinders *d d* having a longitudinal slot mortice throughout their length, for the reception of the corner pieces of the plates. What I mean will be apparent upon inspection of the annexed diagram, *fig.* 2, which gives a plan of a plate with its four corner pieces inserted in the slots of the cylindrical columns, the dark central parts of each being the space where the hot air acts upon the corners of the plates; the heat from which by the conducting power of the metal is quickly communicated throughout. A series of these plates are shewn in *fig.* 1, attached to each other by means of short pieces of chain, which allows the plates to be pressed nearly close together, or the drawing them further apart by the action of the screw *e*. The ends or corner pieces of the plates are shewn as inserted in the hollow coluuns, by dotted lines.

2



"The furnace is at *f*, the ash pit at *g*, the hot air chamber, at *h*. The bars of the furnace are made hollow, which being exceedingly heated by the burning fuel, the cold air rushes through them, abstracting caloric abundantly in its passage, and is received at the back into the hot air chamber, which lines the sides, top, and part of the back of the fire. The air in this chamber also acquires a considerable accession of heat by radiation through the iron partition next to the fire. The chamber is of course kept closed, the front plate being merely removed in the drawing to shew its form; a sliding plate should be made to fit the front ends of the hollow bars, when the quantity of air admitted may be lessened or augmented, which together with a due management of the fire will be sufficient to regulate the heat to any required temperature. The hot air is conducted from the chamber *h* by means of four iron pipes, one to each of the cylindrical pillars; two of these are shewn by the dotted lines *i i*. As the hot air issues from these pipes it ascends the columns, impinging in its progress upon the ends of the plates, and heating them to the degree required for hot-pressing. As some doubts may be entertained as to the intensity of the heat being sufficient for this purpose, I have only to observe that in Mr. Gordon's improved tea-kettle, there is a chamber round the sides of it, the air in which being heated by a lamp placed at the bottom of the kettle, acquires such a high temperature as to *melt glass*.

"Yours, &c. "L. H."

NEW MATERIAL FOR RAIL-ROADS.

A correspondent of ours has promised us a communication containing details of some experiments, made with a view to ascertain the practicability of employing a vitrification of earthen substances, as a substitute for iron in rail-ways, when the latter material cannot be obtained at a sufficiently moderate price.

He proposes to cast the substance in a mould composed of a number of the best bricks laid side by side, and cemented together, having an angular groove or trench on the upper side. The whole mass will then become a substitute for one rail, the width of whose base will be nine inches, and about a yard in length.

The surface of the vitrified substance is proposed to be about five inches in width, and projecting, in a small degree, above the surface of his mould, the surface being slightly curved.

From the best calculation that can yet be made, it appears that the cost will be much less than iron, with the necessary chairs and blocks of stone, in many parts of the country.

It seems, at first, that any vitrification would be too brittle for such a purpose, but when it is considered that the whole will be embedded in so large a mass as that described, and the width of the touching surface regulated as its strength requires, and also that a degree of elasticity can also be given to the base; there are strong

hopes of success. It need hardly be observed that the weight in the carriage must be limited to certain quantities, and that the use of springs to the carriages may be easily applied if necessary.

MOORE'S PATENT STEAM ENGINE BOILERS.

Scarcely a week passes without the promulgation of something new in the construction of boilers, or steam generators. They are, it must be acknowledged, for the most part, but modifications, in a greater or lesser degeee, of previous inventions; and the contrivance we have now to describe, (which is the subject of a recent patent, granted to Mr. John Moore, of Bristol) may, perhaps, be ranked under that denomination, as the little novelty it possesses appears to be a very unimportant feature in its construction: we, nevertheless, present it to our readers as their judgements may lead them to appreciate it more highly than we do.

The boiler consists of a series of tubes, set up vertically and arranged in a circle, with their upper ends entering a circular chamber, bent round, in a horizontal direction, so as to form a ring, and their lower ends entering a similar ring at bottom. Upon a level with the lower ring, or chamber, and within the circle of the vertical tubes, a grating is fixed, and the fuel laid thereupon. The water is supplied by a reservoir, which is also a large tubular ring, embracing the vertical tubes on the outside, a little above the middle; from this the water descends through small pipes and enters the lower chamber, which it fills, and rises up the vertical tubes; here it is exposed to the action of the fire, thereby converted into steam in the upper part of each tube, and the whole quantity thus generated is collected in the upper ring or chamber, from whence it proceeds to the engine. In case the ebullition in the pipes should throw any water into the upper chamber, connecting pipes between that vessel and the reservoir are employed to convey it back into the latter.

SNOWDEN'S WHEEL-WAYS AND CARRIAGES.

" To the Editor.

" Sir,

" In your last I was extremely pleased to find the subject of railways is not forgotten, as no man would feel more interest in seeing it matured than myself.

" I like Mr. Snowden's novel idea of giving the horses a ride, at the same time that they are propelling the carriage, but cannot help thinking that when that gentleman says he hopes to see his project realized, he cannot be serious.*

" In the first place, Sir, I think the expence so great, that it

* It is not to be supposed that the inventor would pay several hundreds of pounds (the cost of his patents) merely for a joke.

would be difficult to find men willing to risk so large a capital as must be required in such a speculation.†

"Secondly,—How can he expect to monopolize sixteen feet of a turnpike road (and he cannot do with less) to work a carriage of such large dimensions;‡ and he must recollect that two such carriages cannot pass each other on the road; that is, one cannot leave London and the other Birmingham, at the same time.||

"Thirdly,—The bed in which his mechanical horse works should be adjusted with almost mathematical exactitude, so that his friction roller wheel might almost fill up without any play. Now in addition to the nature of cast-iron to contract with cold, it becomes very brittle, and likely to loose a tooth now and then from the jerks.§ I think the deals in wet seasons will so expand that the machine will be locked fast; and in dry seasons will shrink enough to throw the wheel out of gear;¶ and what is to prevent its receiving from the opening at the surface, the dust, the rain, and snow ?** so that in milder seasons they will be full of mud, and in seasons like the present, will be frozen up.

"If Mr. S. is correct in his calculation, of the increase of power by such an application of it, why not dispense with his objectionable mechanical horse altogether, and apply the power at once to the wheels of the carriage? and even then the plan cannot succeed, as I think there are no turnpikes, and very few bridges over our rivers and canals, throughout the country, wide enough to receive it.

"I shall be happy, Sir, if you will give this a place in your Register, because it may induce other correspondents to give their opinion respecting it.

"*January* 24, 1826. "Your's, with respect,
"16, *George Street, Shoreditch.* "E. W."

[We have submitted a few brief remarks, in the form of notes, in reply to the foregoing, just as they have occurred to us, without intending to become the advocates for this or any other invention in particular. Those points which we have passed over for want of sufficient space and opportunity to notice, we shall leave entirely to those whom it may concern to answer.] Ed.

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† The expence is calculated at about £4000 per mile, when the modifications very recently made are introduced.

‡ This objection has already been replied to in the text.

|| Simple and easy means are provided by the patentee to admit of carriages passing one another in the same, or in opposite directions, which we shall perhaps have occasion shortly to describe, together with the mode adopted by the patentee to apply steam power to his mechanical horse.

§ This objection, if serious, applies to all rail-ways having teeth or cogs; cast-iron toothed wheels, in a great variety of machinery, move with greater rapidity than ten miles per hour.

¶ Cast-iron is now substituted for the deal planks, and these parts are much simplified since our drawings were taken.

** The matter that may fall through the opening to the bottom of the trunk will not impede the mechanical horse, as that will be raised sufficiently high to prevent even contact with it.

ATKINS' & MARRIOTT'S PATENT STOVES.

"*To the Editor.*

"SIR,

"ALLOW me a few lines in the ensuing number of your valuable little Journal, to reply to the two queries suggested by you, at the close of the liberal account in your last number, of the improvements in Stoves and Grates, for which, in conjunction with Mr. Marriott, I have obtained his Majesty's Patent. You are quite correct in stating, "that coal gas requires about ten times its volume of common air to produce *perfect* combustion." But you will find on examination, that the draft of air may be increased or diminished to *any requisite degree*, in the basement of our new Patent Stoves. The basement also can never become heated *too much* (even with a very large fire), from the great extent of its surface, producing constant radiation of heat into the room. It is in fact the gradual radiation of this caloric into the air of the apartment, so as to keep a room at all times *moderately warm*, which forms one of its principal advantages in point of comfort.

"I am, Sir,

"*Southampton Place, New Road,* "Your Obedient Servant,

"*6th Feb.* 1826. "G. ATKINS."

PATENT CHALK BRICKS.

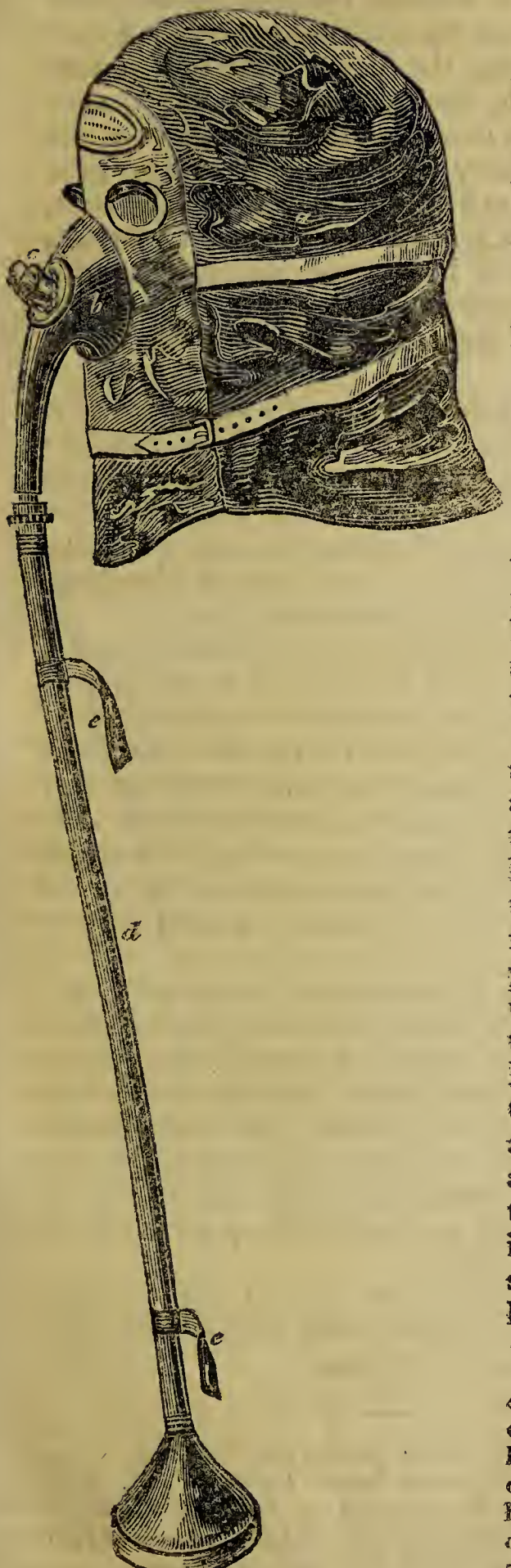
IT would appear by a patent lately granted to Mr. Edward Ellis, of Croxton, near Rochester, that that gentleman assumes the exclusive privilege of cutting stone into the shape and dimensions of bricks, and of applying them to building purposes. The specification states, that there is a certain kind of chalk or stone, found abundantly in Kent and other parts of England, known by the name of "grey stone chalk," which has hitherto been employed for the preparation of lime; but which the patentee now proposes to cut out into bricks for building purposes, of the regulated dimensions; and as these bricks can be used only by himself, or by license from him, it is essential that our readers should be cautious to avoid cutting their "grey stone chalk" into parallelopipedons measuring 9 inches in length, 4½ inches in width, and 2½ inches in depth:—let them "take any shape but that."

ROBERTS'S SAFETY HOOD,

FOR ADMITTING OF SAFE AND FREE RESPIRATION IN THE MOST DENSE AND SUFFOCATING SMOKE, OR AMID THE MOST SUFFOCATING VAPOURS.

IN consequence of the letter signed X.X. in our 60th number, and several subsequent inquiries, we have felt it incumbent upon us to introduce into our columns a description of this truly valuable invention, notwithstanding it has already appeared in most of the periodicals: after repeated experiments of its utility, such indeed appears to be its importance, as a means of saving human lives as well as property, that we should feel ourselves guilty of a crime against

humanity, were we longer to omit giving the invention that increased degree of publicity, which the extensive circulation of our little work enables us to afford.



The form of the apparatus is shewn by the annexed diagram, which gives a side view, as it appears upon the wearer. It consists of a leathern cap or hood *a*, which completely covers the head and face, with strong glasses before the eyes, and exactly fitted to the form by being padded inside with cotton, covered with soft wash-leather; and by means of straps round the hood, it is made to buckle sufficiently tight round the neck to exclude the surrounding air. The upper end of the proboscis *b* is of sufficient capacity to include the nose and mouth of the wearer, and forms the channel through which he respires. At *c* a trumpet-mouthed orifice is formed, provided with a good cork stopper, which is secured by being attached to a small brass chain; the use of this appendage is to afford a ready relief to the lungs without taking off the hood, when the wearer goes to the window or door of a building on fire, for the purpose of respiring a purer atmosphere, or to consult with persons on the outside, the tube forming as it were a sort of little speaking trumpet. Below this part is attached by means of an union joint, a flexible tube *d* about 2ft. 6in. long, and terminating in a funnel 5in. in diameter, in which is contained a sponge saturated with water, or an alkaline liquid.* The flexible pipe is kept

* A slight attention to the nature of chemical absorption, will always direct the operator, to prepare the liquid for the sponge, according to the different gases or noxious airs he may have to contend with. Thus, in cases of smoke arising from fire, it generally abounds with sulphurous acid, car-

expanded by containing within it a spiral coil of wire throughout its length, and the straps *e e* are for the purpose of buttoning it to the dress of the wearer, so as not to incumber him or impede his exertions.

The mode of its operation is as follows, the gaseous and other noxious matters which exist or float in the apartment, are, by the act of inspiration, obliged to pass through the funnel of the tube, where they are absorbed and neutralized by the medium of the liquid, contained in the sponge, and the air is in consequence sent forth to the lungs in a pure state. The efficacy of the apparatus has been repeatedly proved, in the presence of numerous scientific individuals, in close chambers rendered air-tight in the most dense smoke, arising from the combustion of wool, wet hay, wood-shavings, besides large quantities of sulphur, in temperatures varying from 90 to 240 degrees Faht. and during spaces of time from 20 minutes to ¾ of an hour.

Among the chief uses of this invention, are the ready means it affords of entering houses and ships on fire to rescue lives, and save valuable property; in enabling many manufacturing processes to be conducted with safety and convenience, where the workmen have heretofore been under the necessity of inhaling the most pernicious vapours; we allude in particular to the operations of bleaching, gold-refining, smelting, the preparation of ammonia, &c.

This invaluable apparatus is the invention of J. Roberts, a miner, who has been more than five years in bringing it to its present improved state, during which time he has had the satisfaction of saving numerous lives, by the use of it, particularly after explosions in coal mines. The apparatus is extremely portable (weighing only about three pounds) though made of the most substantial materials; it may be conveniently worn by any person for a considerable length of time; the expence, is only about three pounds ten shillings, and its efficacy unquestionable in the cases mentioned, as well as many others.

The invention has received the approbation of the most distinguished chemists and men of science in the kingdom; the Society of Arts have testified their sense of its value by a reward of 50 guineas and a medal; the Manchester Guardian Office, 50 guineas; and his Majesty, with a reward of 100 guineas; besides numerous rewards and testimonials, from various public bodies, and persons of rank and science; it has also been patronized by the Admiralty, by all the principal fire offices, and will soon come into general use for the different parishes and fire stations.

They are manufactured and sold by the agent of the inventor, Mr. Jones, Plumber, Tysoe Street, Clerkenwell, where every information respecting them may be readily obtained.

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buretted hodrogen, and carbonic acid, which jointly may be absorbed by pure water: as also sulphuric acid and muriatic acid. Carbonic acid, nitric acid, &c. may be absorbed by the addition of potash, or any other alkali, to the water. Chlorine, &c. by the assistance of lime; but in all cases of combustion arising from fires, water has been found to be fully adequate.

THOMPSON AND BURR'S PATENT REVOLVING STEAM BOILERS.

To economise fuel, as much as possible, in the generation of steam, appears to be the grand desideratum with many of our recent patentees, who seem to consider the expense and complexity of their apparatus quite of minor importance; the present invention is, we think, an example of the truth of this remark.

The patentees (Mr. Thompson, of Chelsea Steel Works, and Mr. Burr, of Halesowen, near Birmingham,) describe their invention to consist in causing the boilers or generators to revolve in the furnace; the object of which is, that their whole surfaces may be equally exposed to the action of the fire, so as to produce an uniform heat to the water, and an equal expansion of the metal of which they are constructed.

In the drawings attached to the specification, the most approved arrangement of the boilers is shewn. It consists of four cylindrical vessels, placed horizontally and equidistant over a furnace, with the pivots or axles upon which they revolve, placed outside or beyond the range of the fire; each of these axles carries a cog wheel, all of which are caused to revolve, by the rotation of a fifth cog wheel, upon a separate axis, placed centrically between the four; and this central shaft and cog wheel is put in motion by gearing of the ordinary kind, which we need not describe.

The boilers are supplied with water from one end of their respective axes by means of a forcing pump, the escape of which during its transmission is to be prevented by means of stuffing boxes, with a valve opening inwards, which will be kept closed by the expansive force of the steam, excepting at the moment when the superior power of the pump injects a portion of water. The steam as it is generated passes off at the opposite extremity of each boiler, through their opposite axes, and escapes into a "*gasometer* or vessel," from whence it is to be drawn for feeding an engine, or for any other purpose.

We trust our readers will understand the principle of the invention from our brief description, without the aid of illustrative diagrams, and we doubt not that its merits will be deservedly appreciated. As respects the latter point, the patentees state that by their apparatus, "the quantity of steam produced by the same portion of fuel will be found much greater than by any means yet employed for the generation of steam."

RAMAGE'S LARGE REFLECTING TELESCOPE.

Mr. Ramage, of Aberdeen, has ever since the year 1806 devoted much of his time, and his talents, in the construction of reflecting telescopes of large dimensions and of convenient frames and supports, in which firmness of structure and facility of adjustment to any required position might be equally attained. In November last a model of one of these was exhibited to the Astronomical Society of London, and at the following meeting of the Society in December,

a paper, descriptive of the original, was read with reference to the model exhibited, from which we collect the following particulars.

The tube is 25 feet in length; the platform upon which the telescope is made to revolve at the pleasure of the observer, is a strong circular rail-way of cast iron, 2½ feet in diameter, and 4 inches in breadth. The horizontal azimuth motion is upon concentric rollers, round a central pivot, and the whole is fixed on a strong stand or frame of simple construction. The tube of the telescope is elevated to the required altitude by a winch and tackle of pulleys. The gallery in which the observer stands is adapted to the proper height by a similar winch and tackle, and to prevent accident by the breaking of the ropes, it is supported at each side by two moveable bars that fall into the steps of the ladders, which constitute a part of the frame. The lower end of the tube rests upon two rollers, and at great altitudes moves forward, so that the tube itself is capable of adjustment to all positions, from that which is nearly horizontal, to that which is nearly vertical. Without quitting the gallery, the observer can move the tube both horizontally and vertically upwards of 10° and can with the utmost readiness (independently of an assistant) direct the telescope to any point in the heavens. All the motions are effected by means of a very few cords, pulleys and winches. The diameter of the speculum is 15 inches, and the focal length 25 feet. The eye-pieces, which are adapted to magnify the image, possess powers varying from 100 to 1500; and there are proper diaphragms to modify the redundancy of light. The mode of observing is by the "front view."

Mr. Ramage exhibited to the Society, besides the model before mentioned, two speculums: one of 15 inches diameter, belonging to the telescope described, and one of 21 inches diameter with a focus of 54 feet.

History of the Steam Engine,

From its First Invention down to the Present Time.

Of all the discoveries which have dignified the name of man, none have contributed more to his advancement in power than the Steam Engine. Other inventions have raised his intellectual greatness far beyond the anticipations of rational conjecture. He has numbered the stars, described their orbits, and brought within the grasp of his faculties the myriads of orbs which had been esteemed beyond the compass of his feeble vision. He has safely traversed the trackless ocean, and been enabled by the invention of the compass to pursue his way over the "watery vast" with comparative security and certainty. He has stopped the course of rivers, and converted the shallow rivulet into a spacious and navigable channel, for the removal of his manufacture and his produce. He has changed the barren wilds into the theatre of his genius, and rendered subservient to his

ends the unfrequented desert. His ingenuity taught him to tame and press into his service the beasts of the field, and employ them as he found their power, their swiftness, or their fidelity, useful in the promotion of his plans. But if the capabilities of man were wondrous before the invention of the Steam Engine, what have they been since? The mighty powers of giants, contrasted with the feeble efforts of pigmies. Already had it been foreseen that the increased demand for produce would require a supply beyond the power of man to procure it. Already the evils of inordinate labor were severely felt among the lower classes of society; when this new luminary, the brightest in the constellation of human discoveries, burst in upon us. Then were our limited powers increased beyond all calculation. Then were our faculties as varied as powerful. For in the Steam Engine we have been enabled to unite the opposite extremes of utility. It separates the fine film of the silk worm, and realizes the fairy fingers of fiction by spinning an invisible thread. It rends the rock from its bed, and splits in sunder the huge oak. It tears from the bowels of the earth the useful mineral which is our fuel, and brings it to the surface in safety. In short, in the eloquent language of Jeffrey, "It has become a thing alike wonderful for its force and flexibility; for the prodigious powers which it can exert, and for the ease and precision, and ductility, with which it can be varied, distributed, or applied."

The prominent part it now assumes in all branches of commerce demands that every one who must act a part in society should be, in some degree, acquainted with its nature and effects. Such a knowledge is intended to be communicated in the following history. We have spared neither study nor research to render ourselves interesting and intelligible; and if we can conclude our labours with a conviction that we have in any degree enlightened our fellow-men we shall have obtained our reward.

CHAPTER I.

Contents.—THE PROPERTIES OF STEAM DISCOVERED BY ACCIDENT.—HERO, THE ELDER.—DE CAUS' ENGINE.—BRANCA.—MARQUIS OF WORCESTER.

THE early history of the Steam Engine is involved in great obscurity. Notwithstanding many able disquisitions in the endeavour to discover to whom the merit of first inventor is due, nothing satisfactory has been developed in the enquiry. It is singular that, until steam had arrived at some degree of perfection as a mechanical agent, almost every one who made any slight improvements, laid claim to the rank of first discoverer. Thus different nations in Europe have set up different individuals as the persons to whom the honor should be awarded. Among such a variety of claims it is difficult to decide: we shall, therefore, content ourselves by expressing our opinion, that the elastic properties of steam have been known from the first dawn of civilization. The probability is, that the discovery was owing to the bursting of some culinary vessel, the mouth of which had been closed through ignorance of the effect which would thereby be produced. Indeed, it was impossible for mankind to have remained unacquainted with this property of vapour after hot water had been used for any purpose.

But the first individual on record who applied this known property to produce any effect, appears to have been Hero, the elder, an Alexandrian, who flourished about 130 years before the Christian era. In his work, entitled

Spiritalia, among other ingenious discoveries, he describes a machine to which motion is to be given by the force of steam. It consisted of a hollow globe, having tubular arms running in opposite directions. These tubes had an opening at different sides near their extremity. The globe was suspended upon centres, fixed upon pillars. One of those pillars was hollow, as also was one of the centres. Steam was introduced from a cauldron, or heated vase, which, issuing through the hollow column and centre into the globe, and so through the arms into the open air, produced a rotatory motion, in the same manner as water produces that of Barker's mill. This invention being the first in which steam was employed as an agent, entitles HERO to the honor which has been the subject of so much dispute.

In the dark ages which succeeded the overthrow of the empires of Greece and Rome, history furnishes no instance of an attempt to use the powerful agency of steam, until the year 1560, when one Mathesius suggests the practicability of a plan by which it could be employed. In Leipsig, a machine, upon a similar plan to that of Hero's, was proposed to be substituted for the turnspit dog then in use.

Up to this date we cannot trace any thing important relative to the application of steam excepting what we have already stated. We are unable, at this remote period, to form any idea as to the originality of the plans which have been named. It is impossible to state whether they were descriptions of what was generally known, or they were the invention of those by whom they were claimed. Nor should our readers be surprised at the obscurity in which these matters are involved, when we reflect that, there is frequently great difficulty even at the present day in deciding who are the inventors of the most meritorious productions.

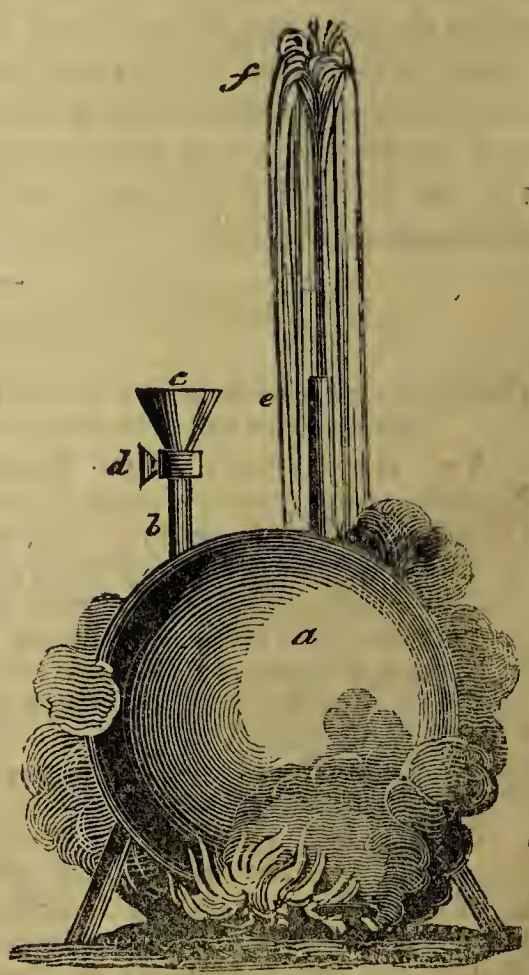
Having briefly stated what is recorded respecting the earlier history of the steam engine, when it had more the character of a philosophic toy than any thing truly useful, we come to speak of the first attempt towards its adoption as a powerful agent.

It is described in a work by Solomon De Caus, an eminent French mathematician and engineer, published in 1615, entitled "Les Raisons des Force mouvantes avec divers Desseins de Fontains.'

The following description will explain the principle of his invention.

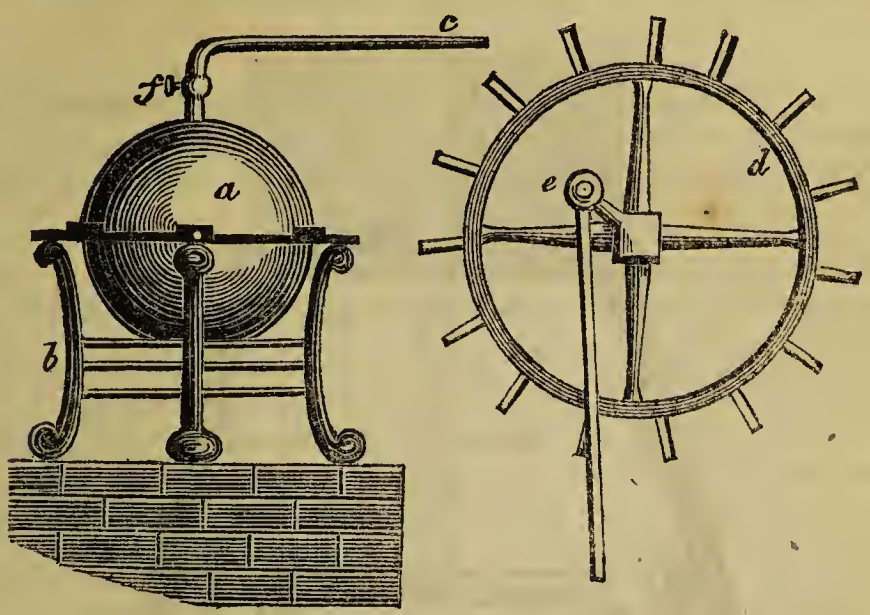
a is a spherical vessel, placed over a fire; it is furnished with two pipes, *b e*. The pipe *e* is open at the top, and reaches down to the bottom of the vessel *a*. The pipe *b* is furnished with a cock *d*, and funnel *c*. The vessel being filled with water, and fire applied, steam is speedily generated upon the surface of the water, and having no other way to escape, the cock *d*, being stopped, presses on the surface, and so forces it up the tube *e* into the air, causing a jet which varies in proportion to the elasticity of the steam within.

De Caus appears also to have been aware that a vacuum could be obtained by the condensation of steam, but we have no opportunity of knowing whether he ever thought of using it as a means of increasing the power of his machine.



The engine which next demands our attention, both on account of its importance and date, is that invented by Giovanni Branca, an Italian mathe-

matician, who resided at Rome, at the commencement of the seventeenth century. We are indebted, for our knowledge of this machine, to his own account, published in 1629. The drawing which he there furnishes must be understood rather as an ornamental illustration of his plan, than as the form in which it was actually constructed: we have, therefore, given one which we conceive to be more consistent with the end he proposed to effect by its use.



The boiler of this engine is represented by *a*; *b* is the fire grate; *c* a small pipe, provided with a stop cock *f*; *d* is a wheel furnished with vanes; *e* is a crank which gives motion, through the medium of the connecting rod, to a stamper for pounding drugs. The principle of action is this. Steam is generated in the boiler, and rushes violently against the vanes which causes the wheel to revolve, and thus produces a reciprocation of the rod and stamper.

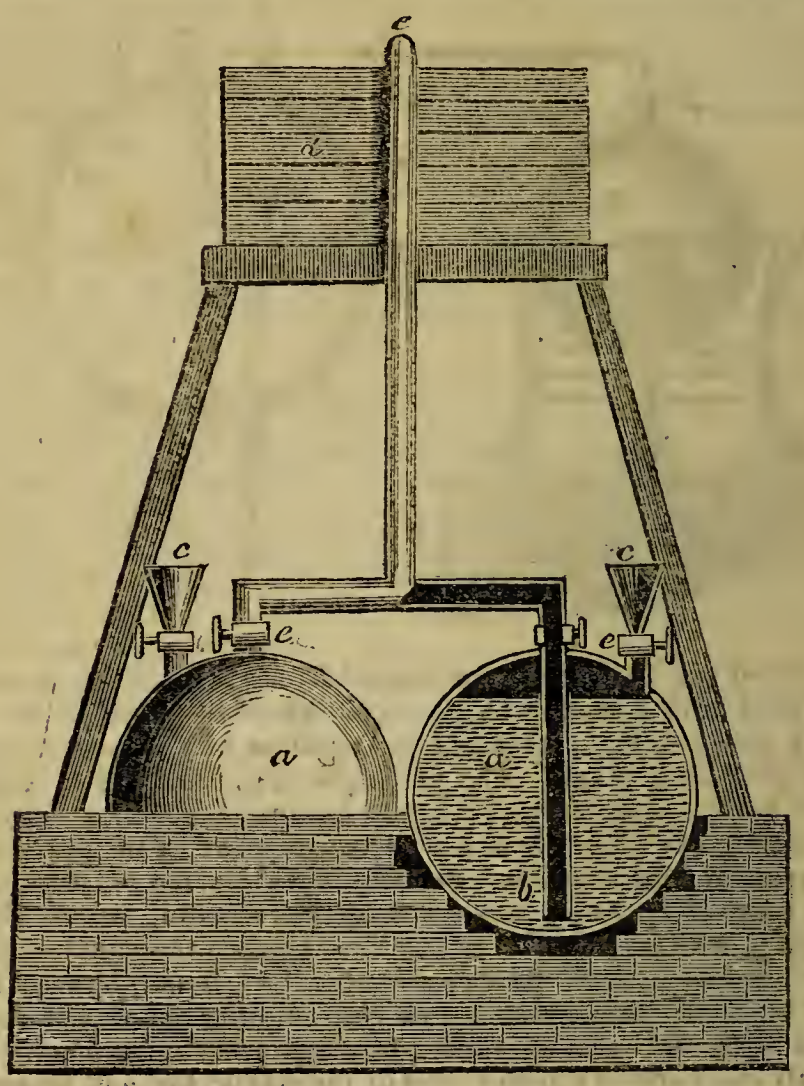
This invention had remained unnoticed but by the learned, until the last few years. It was recently described by Partington, in his History of the Steam Engine, who goes so far as to allow Branca the merit of the *first idea*. We believe our readers will perceive that to this honor Branca has no claim. His engine is on the same principle as Hero's, only differently modified. Its ingenuity is decidedly inferior to its prototype both in simplicity and effect.

But of all the various applications of the elastic force of steam; none have stood so high in public estimation as a brief description of "*a fire water work*" contained in the Marquis of Worcester's celebrated "Century of Inventions," dated 1663; the original manuscript of which is preserved in the British Museum. The following is the marquis's own description:—

"68. An admirable and most forcible way to drive up water by fire, not by drawing or sucking it upwards, for that must be, as the philosopher calleth it, *infra sphæram activitatis*, which is but at such a distance. But this way hath no bounder, if the vessels be strong enough; for I have taken a piece of a whole cannon, whereof the end was burst, and filled it three quarters full, stopping and screwing up the broken end, as also the touch-hole; and making a constant fire under it, within twenty-four hours it burst and made a great crack: so that having found a way to make my vessels, so that they are strengthened by the force within them, and the one to fill after the other, I have seen the water run like a constant fountain-stream forty feet high; one vessel of water, rarified by fire, driveth up forty of cold water; and a man that tends the work, is but to turn two cocks, that one vessel of water being consumed, another begins to force and refill with cold water, and so successively, the fire being tended and kept constant, which the self-same person may likewise abundantly perform in the interim between the necessity of turning the said cocks."

From this account Dr. Robinson founds an opinion that "the steam engine was, beyond all doubt, the invention of the Marquis of Worcester." It is probable that the learned doctor was unacquainted with De Caus' and Branca's

previous experiments; or he could not have come to this conclusion. But whilst we cannot admit the marquis to be entitled to the extravagant encomiums which have been lavished upon him, we are far from disallowing his invention to possess merit and originality. The annexed drawing we consider to be a fair representation of the engine, according to the marquis's intention and description, "fulfilling the conditions of the *enigma*, *and no more*."



Let *a a* represent two vessels, (one of them in section) *c c* two funnels, furnished with stop cocks; *b* a pipe reaching down to the bottom; a similar pipe extends to the bottom of the other. Both these pipes are connected with a perpendicular tube *e*, which is continued above the top of the cistern or reservoir *d*. It is there bent so that the mouth shall be directed to the interior of the cistern. Let us now examine the operations of this engine.

We will suppose the vessel, of which we have given the section, to be filled with water through the funnel *c*. The cock of that funnel is then closed, as also the cock *e* of the other vessel. The fire is then lighted under the first vessel, and as soon as a sufficiency of vapour is formed, the cock *e* of this vessel is opened. The elasticity of the steam acts upon the surface of the water, which, finding an escape through the pipe *b e*, rushes rapidly upwards into the cistern *d*. During the performance of this operation "the man that tends the work" fills the other vessel with cold water, and applies the fire to it also, so that by the time the first is exhausted, the other, upon charging the necessary cocks, "begins to force and refill," that is, *repeat the action of filling* the cistern.

By this reading of the marquis's project we have a very feasible and ingenious machine for raising water. It is evidently an improvement on De Caus' engine, and the application of another vessel constitutes this improvement. It has been the marquis's design, by the addition to save the time which was lost between the exhaustion and re-action of a single vessel; and this he effects by the use of the two vessels.

There can be no doubt but the Marquis of Worcester was aware of the plan proposed by De Caus; we have, therefore, to regret the want of candour which made him put forth the "fire water work" as his original invention: making this deduction from his merit as a man, we feel ourselves bound to award him a greater portion of approbation than some writers have been inclined to allow him.

[*To be continued.*]

The Pantochronometer.—"This is a very clever and ingenious instrument, and is made by Messrs. Essex & Co. It is a combination of the compass, the sun-dial, and the universal time-dial, and performs the uses of all three. As a compass it discovers the situation of the inspector, in regard to the cardinal points; as a sun-dial it denotes the hour; and as an universal time-dial, with some accompanying tables, shows the time at most places throughout the globe, together with their longitude. As an instrument for teaching the relative differences of time throughout the world, it is admirable, and forms not merely a useful, but a very amusing astronomical instrument. It is fitted in boxes adapted to the pocket, or mounted on elegant vases and pedestals, and we can, therefore, recommend it as an interesting ornament for the chimney piece of the drawing room, and an useful companion in a study, or on a voyage."—*Literary Chronicle*, No. 349.

A Meteoric Stone—weighing 16 pounds 7 ounces, fell on the 10th of February last, at Nantgemory, in Maryland. The explosion and the whizzing noise which accompanied its fall, was heard by many persons over an extent of fifty square miles. The stone buried itself in the ground to the depth of from 22 to 24 inches.

LETTERS OF ENQUIRY.

On accelerated motion, by E. D. B.—"It is well known that a carriage will, by the force of gravity, move with an accelerated force upon an inclined plane (rail-road) when the inclination is 1 in 135. Suppose the inclined plane be continued indefinitely, is there any limit to the velocity it will travel? allowance being made for friction and the resistance of the air."

On the best means of preserving Exotic Plants, *by A Constant Reader.*—"The ease with which many tender exotic plants are raised in summer, and the difficulty with which they are preserved in winter, render a ready means of effecting the latter object particularly desirable. I have no doubt that if the attention of some of your correspondents could be directed to this subject, the country would soon be in possession of a cheap and easy method of preserving the stock of green-house plants, many of which now perish annually, or are kept alive with much care and cost."

On the culture and curing of Tobacco, by T. W.—"who will be greatly obliged by being informed of the most improved mode of cultivating and curing the tobacco plant in the country from whence it is imported."

LIST OF NEW PATENTS.

GENERATING STEAM.—To J. M'Curdy, of Cecil Street, Strand, for improvements in generating steam. Dec. 27. Six months.

WATCH MAKING.—To J. Ogston, and T. Bell, of Davies Street, Berkeley Square, for improvements in the construction of watches. Jan. 6. Two months.

DISTILLATION.—To Richard Evans, of Queen Street, Cheapside, for improvements in the apparatus for and process of distillation. Jan. 7. Six months.

SPINNING.—To H. Houldsworth, jun. of Manchester, for improvements in spinning machinery. Jan. 16. Six months.

FIRE-ARMS.—To Benjamin Newmarch, of Cheltenham, for an improved method of exploding fire-arms. Jan. 16. Six months.

WEAVING.—To John Rothwell, of Manchester, for improved heald or harness for weaving purposes. Jan. 16. Two months.

TO OUR READERS AND CORRESPONDENTS.

HISTORY OF THE STEAM ENGINE.

With the intention of increasing the general utility of The Register, we have made arrangements with a gentleman of science (who is practically conversant with every thing relative to Steam Machinery) to furnish us with a History of the Steam Engine; which is commenced in the present Number, and will be continued in each successively, until completed. It will describe in its course many important Inventions which have never yet been laid before the public. The illustrative drawings will be ALL ORIGINAL, and many of them extremely novel and curious.

It would be needless to expatiate on the advantages that must result to a great proportion of our readers by being possessed of correct information of this solid and interesting nature; as they will be sufficiently appreciated by all to whom more expensive works are unattainable, and who will hereby be enabled to REGISTER *in a convenient and cheap form much that has been* hitherto *beyond their access.*

E. D. B.'s very ingenious and useful Alarum was intended for insertion in the present Number, but an accident having occurred to the engraving obliges us to postpone it till the next.

I. I.'s Letter has been received; he must excuse our giving it insertion, as we have a great dislike to occupy our pages with a controversy upon matters of such trivial importance.

A CONSTANT READER will perceive upon reflection that his machine cannot act at all; the two bevil wheels upon the shaft *S* will lock all the gear fast instead of communicating motion. We recommend him to make a model, when he will discover some other errors: a simple crank will answer all the purpose of *h i j*. Some parts are original and well contrived; and when the subject is more matured we shall be happy to give it publicity.

H. R. has our best thanks.

NOBODY, from a very mischievous, is becoming a very useful person: the document he has kindly sent to us is a real treasure.

T. O.—MECHANICUS,—and AN OLD SAILOR, are received.

E. G.—and PRO BONO PUBLICO, if possible, in our next.

Correspondents will have the goodness to remember that Letters and Communications received after the Wednesday which precedes the day of publication, cannot be noticed in that week's number.

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REGISTER

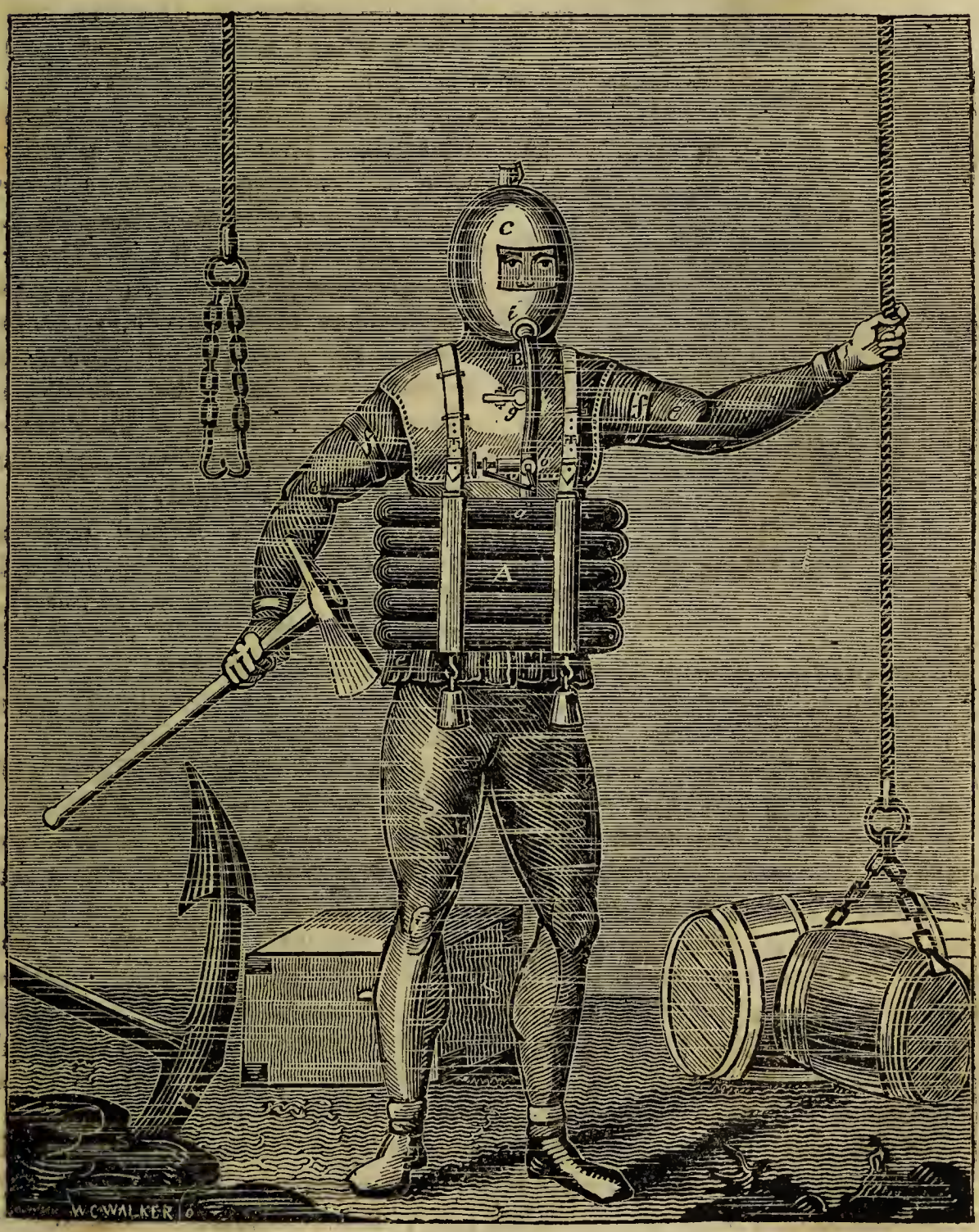
OF

THE ARTS AND SCIENCES.

No. 64.] SATURDAY, FEBRUARY 25, 1826. [Price 4*d*.

CONTENTS:

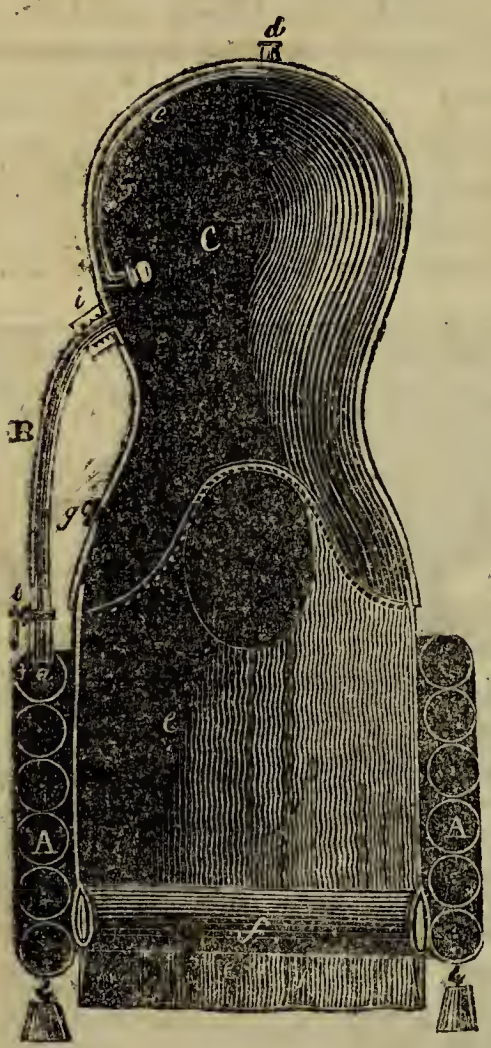
James's Patent Diving Apparatus,..... 242
New Alarum, applied to Watches,..... 243
Dr. Alban on his New Steam Apparatus,.. 245
Gordon's Improved Tea Kettles, ... 248
Gordon's Patent Naptha Lamps, ... 249
Mr. Brunel's New Mechanical Power, .. . 247
On an improved Mode of Hot-Pressing..... 250
History of the Steam Engine, Chap. II. .. 251
Lamp for Burning Fat..... 255
The Menai Chain Bridge, ... ib.
Letters of Enquiry,..... 256
Patents, Correspondeuce, &c. ..... ib



JAMES'S PATENT DIVING APPARATUS.

JAMES'S PATENT DIVING APPARATUS.

A very ingenious and, we think, successful attempt, has been made by Mr. W. H. James, of Thavie's Inn, to construct a diving apparatus that will enable the wearer to descend to the bottom of deep water, and remain there for half an hour, or more, to execute a variety of important operations, altogether impracticable without it: such as the recovery of sunken property, the obtaining of coral and pearls, building under water, &c. For some of these purposes the diving bell has of late years been employed, but as the workmen who descend can only carry on their work within its narrow limits, their operations are very much restricted. To overcome this inconvenience and give a more extended range to the actions of the diver, so as to render them more effective and useful, has been the laudable object of Mr. James, in his invention, which has recently become the subject of patent right.



The diver is attired with a portable vessel, (placed around and adapted to the figure of his body), which is filled with condensed atmospheric air, and by means of a simple arrangement of pipes and judiciously constructed valves, he is enabled to supply himself with fresh air for respiration during the time he is under the water.

It must be obvious that an apparatus on these principles will admit of considerable variation in the construction, which have therefore been contemplated by the patentee in his specification; we must however restrict ourselves to the description of one of the most eligible forms and its mode of operation.

In the two accompanying diagrams, figures 1 and 2, the letters in each refer to the same parts. The first gives a front view of the diver fully equipped with the apparatus, and supposed to be engaged in the recovering from their hiding place in the deep, a variety of sunken property, and *fig.* 2 gives a section of the apparatus on a larger scale for the better understanding of its several parts.

A is the vessel to contain the condensed air, which is to be filled by means of a condensing air pump; it consists of a series of strong metallic tubes, or one continuous tube, coiled elliptically round the body, and connected together by bands, to which straps are attached to secure it in its position. At *a* is a valve opening inwardly,

through which the air is to be forced by a condensing pump, until it has acquired the desired degree of density; or the vessel may be filled, by attaching to the valve *a* a reservoir already filled with condensed air, and allowing it to flow through the same until the pressure becomes equalised. The degree of density required will of course be determined by the time it is proposed for the diver to remain under water. (With a vessel of the magnitude exhibited, thirty atmospheres are considered sufficient for an hour's consumption.) B is a tube made of caoutchouc (or Indian-rubber) for conveying the air into the water-tight helmet C, by means of a valve admirably contrived, so as to be under the complete and easy control of the diver. The helmet may be made of any water tight material, but thin copper is recommended; it is provided with a strong plate of glass in front to enable the diver to see surrounding objects. Inside the helmet is a flexible tube *c*, with a mouth-piece at the end, which comes near to the mouth of the diver; through this the air is discharged from his lungs, which passes out of the valve *d*, shewn in the upper part of the helmet. At the lower part of the helmet and round the breast, back and shoulder, a water-proof garment *e* is attached, fitting closely round the body of the wearer, and made fast by elastic bandages *f*. To secure the diver from being inconvenienced by the pressure of the air within the helmet becoming too great, a safety valve is inserted about the breast to allow the desired portion to escape.

Notwithstanding the weight of the apparatus, (amounting perhaps to 50lbs.) the density of the water at great depths, would render the body of the diver too buoyant to enable him to keep on his legs, and execute his work; in those cases it will become necessary to attach weights to his person, capable of being easily removed, if desired, some are therefore shewn in the diagrams as attached to the apparatus; these however it may be desirable to place lower down his person, about his legs or feet.

The patentee likewise contemplates the employment of the same apparatus, *divested of the weights*, in mines and other places filled with deleterious gases, wherein it may be used with perfect safety and advantage.

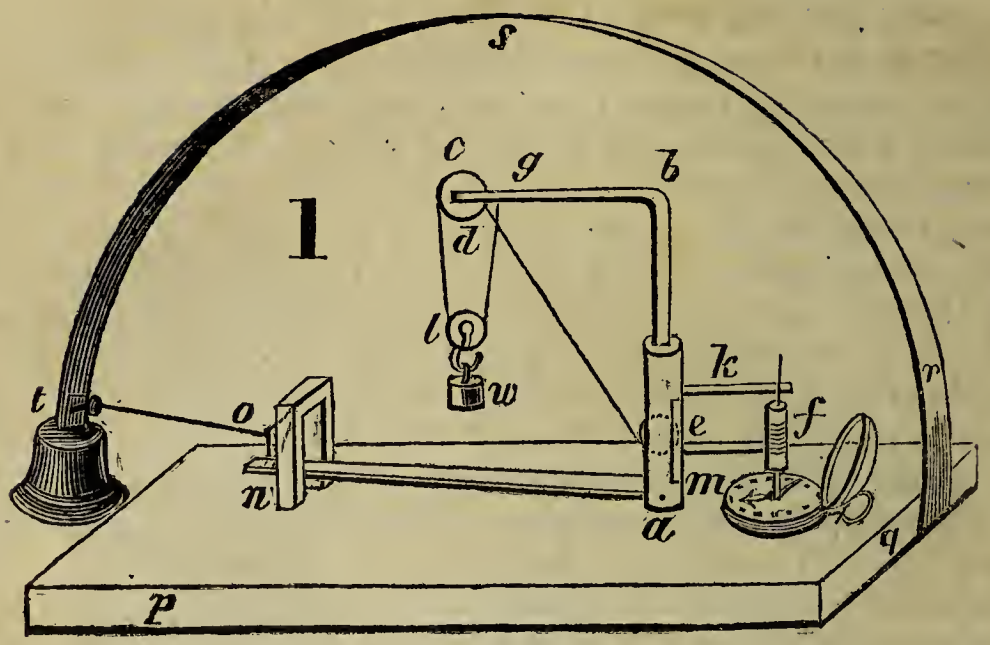
NEW "ALARUM."

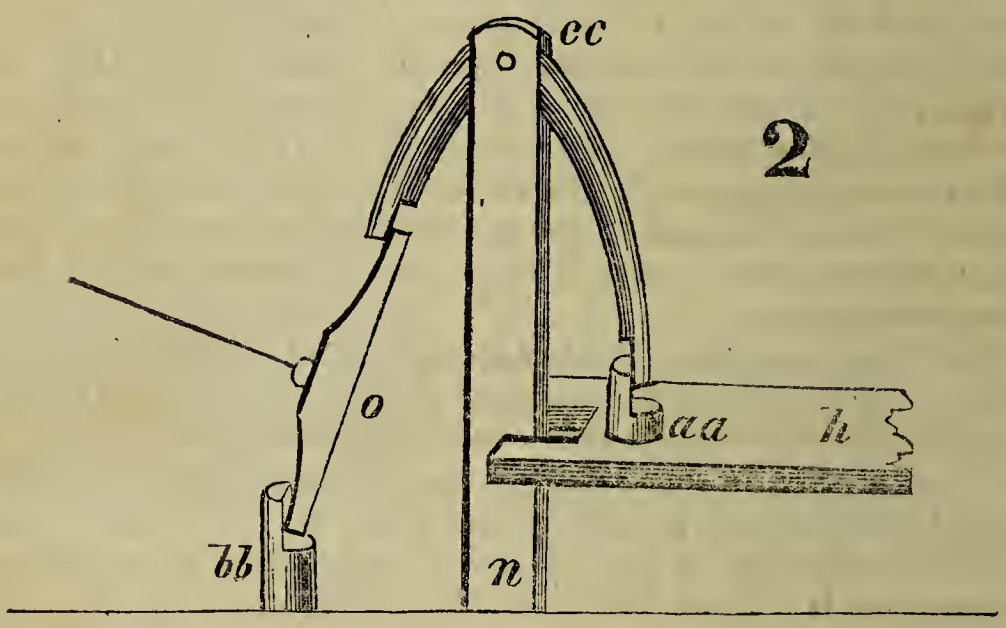
"To the Editor.

"Sir,

"If the inclosed drawing of a new kind of *Alarum*, which I have constructed, will be of any service to your readers, I shall feel gratified at being afforded an opportunity, of again contributing my mite towards the stock of valuable information, with which your pages are enriched.

"In a solid frame of wood P Q, about eight inches by four, and one thick, is inserted a metallic rod, bent into a right angle at *b*, to which are attached a small rod *k*, and two fixed pulleys *d* and *e*. F, is a cylindrical piece of wood, having inserted at one end the pipe of a





watch key, by which it may be made to rest on the pivot of the watch (the watch is sunk a little into the frame) and turn with the minute hand, and at the other, a pin which keeps it steady by passing through a hole in the rod *k*. A thread which is fixed to the piece *f*, and may be rolled round it, passes under the pulley *e* over *d*, and round the moveable pulley *l*, to which the weight *w* is attached, and being brought through a hole in the rod *b c*, is fixed there by the pin *g*. This pin is used to regulate the length of the thread, so that when it is completely wound off the cylinder *f*, the weight *w* may rest on the plane *h*, this plane is moveable on a pin at *m*. The bell is fixed to one end of a long spring *r s t*, the other end of which is fastened to the board at *r*, at *t* is fixed a string, which keeps the bell in the position represented in the figure, by means of a bit of wood *o*, inserted into two notches, one in the plane *h*, and the other in the horizontal part of the frame *n*, the friction of the bit *o*, prevents the plane *h* from falling. It will be easily perceived, that by winding the thread a certain number of times round *f*, the weight *w*, will be raised to a height from which it will take it so many hours to descend to the plane *h*, and that when it does reach that plane and press upon

it, the bit *o* will be released from the notch, and the elasticity of the spring will make the bell ring with considerable violence, and for some length of time.

"In the *fig.* 2, the bit of wood is pulled tightly by the string attached to the bell, against one end of a bent piece of brass which turns on a pin at *c c*, the other end of the brass thus pressing on a piece of metal *a a*, inserted in the piece *h* with sufficient force to sustain it. When this piece (*h*) is pressed down by the weight, the piece of brass swings loose and releases the piece *o*, and of course the bell. I should recommend the contrivance to release the bell in *fig.* 2, in preference to the other, being more sure, especially when the spring pulls with some force.

"I beg leave to state, that I have constructed several alarums on this plan, as presents for friends, and found them to answer extremely well. "I remain Sir,

"*Darlington, Durham,* "Your obedient Servant,

"*January 26th,* 1826. "E. D. B."

P. S. Would any of your readers be kind enough to answer the following.—

It is well known that a carriage will by the force of gravity, move with an accelerated force upon an inclined plane, (rail-road) when the inclination is 1 in 135. Suppose the inclined plane be continued indefinitely, is there any limit to the velocity it will travel? allowance being made for friction and the resistance of the air.

DR. ALBAN'S STEAM GENERATING APPARATUS.

"*To the Editor.*

"SIR,

"A REVIEW of my steam generating apparatus, has appeared in the Repertory of Arts for February, wherein so many doubts are expressed as to its practicability and utility, that I feel called upon to say a few words, in order that the reviewer and the public may be set right in regard to the same.

"With respect to the first observation, touching the originality of my invention, metallic baths having been long used in the laboratory of the chemist; I reply by asking these simple questions. Is less merit due to the great Watt, for having first applied the condensing apparatus in steam engines, because condensers were long before used in distilleries, and by every apothecary; or is the first application of the crank to steam engines a contrivance undeserving of notice, because it previously existed in every spinning-wheel? That a friend of the reviewer had my invention in his private memorandum book before I patented it, could not possibly be known to me in Rostock, when four years ago I laid the foundation for that invention. Why did not that friend get before hand with me, and secure a patent, especially since "he thought it might prove an useful addition to Mr. Perkins's Steam Generators?"

"The vertical position of my metal vessels in the furnace, does not

prove me to be unacquainted with the observations of Count Rumford, and the physical fact established by them; but, considering that the reviewer has otherwise very correctly described my furnace, he rather betrays a want of knowledge of the fact, that when heat is conducted *downwards* in a furnace, it is thereby, owing to its tendency to ascend, arrested and made to deposit itself in the flues and passages, while only the less heated portions of air are drawn off into the chimneys, thus obviating the supposed defect. If the reviewer will take the trouble to look at the construction of my furnace, he will see how unfounded is the charge, of my not having scientifically arranged the disposition of my metal vessels in the furnace, and of my ignorance of a fact so well known, as that to which he alludes. If the reviewer has ever heard of the stoves used in Russia, and will take the trouble of reading what has been written in German by Wagenmann and Prechtl, respecting the most advantageous methods of heating furnaces,* it may render him more cautious and correct in future, when reviewing inventions.

"In a fluid metallic mixture, the communication of heat is nearly equable in all directions, a vertical disposition of the tubes, is, therefore, in no wise, objectionable. What applies to heated air, passing off quickly through the vertical draft passages of a furnace, as a very bad conductor of heat, does not extend to an easily fusible metallic mixture. Having discovered by incontrovertible facts, that my generators evaporate 12 pounds of water, at 32° Fahr. with one pound of coal, the reviewer is but ill borne out in his argument, in as much as this result exceeds every other, hitherto obtained by common boilers.

"The reviewer has asserted, that, at the heat which I profess to use with my generators, "the water on entering them, will be decomposed, its oxygen combining with the iron, and thus, more or less rapidly corroding the tubes, while its hydrogen will pass off with the steam, risking explosions."

"In answer to this, I have to state, that water is not decomposed in generators, at least not in a degree whence any danger can arise, until these become of a red heat, or of 1077° Fahr. At the melting point of lead or 612° Fahr., scarcely any perceptible decomposition will take place, and that the heat in my generators never exceeds the melting point of lead, is clearly proved by the fact, that I apply this metal in a solid state, to some parts of its jointings, and that this has never yet melted, although the injection of water has repeatedly been discontinued for hours together. I am also able to remove all apprehension on the score of corrosion in the iron tubes, for after having been in constant use for six weeks, they are now as free from oxidation as when first put in.

"To the assertion of the reviewer, that "the small tubes of the apparatus will become clogged with incrustations," I have only to

* Vide, "Verhandlungen des Vereins, zur Beförderung des Gewerbfleisses, in Preussen," 2ter. Jahrg, p. 99, and 3ter. Jahrg, p. 100, by Wagenmann, and "Jahrbücher des Polytechnischen Instituts in Wien, vol. 6, p. 189," and "System der Brennstoff Sparkunst Haarlem, 1806, by Prechtl."

remark, that in my tubes, no incrustation whatever takes place. The deposit of the water remains in the state of loose powder, which, by the strong ebullition of the water, is thrown up the tubes, and is mostly found lodged in the lateral chamber, while the small portion of this powder which remains in the upper part of the tubes, may be wiped away with a brush, as easily as one would clean a gun barrel. The whole process of cleaning my generators, (an operation, which, in common boilers, requires the hard labour of days,) is, at most, the work of two men in two hours, including the time employed in taking asunder and putting together the generators.

"It might well have been expected, that any one, undertaking in a respectable publication, to criticise an invention, would have been acquainted with the fact, well known to every stoker of a high pressure engine, that the deposit of water never adheres in a high pressure boiler.

"I should have been glad, if, before putting forth his doubts respecting the practicability of my apparatus, the reviewer had taken an opportunity of inspecting the same when at work. A friendly conversation might then have obviated the necessity under which I now find myself, when thus for the first time, publicly assailed, of exposing his want of information.

"It is my intention shortly to lay before the world, a work, wherein will be found more information respecting my generating apparatus, and the reasons which have guided me in its arrangement.

"*London, 8th February,* 1826. "Yours, &c.
"ERNST ALBAN."

NEW MECHANICAL POWER.

It is now nearly a twelvemonth since it was currently reported that one of our first chemists was actively employed conjointly with a very eminent engineer, in constructing an engine in which the motive power was to be derived from the expansion of liquid carbonic acid into the gaseous state. Whether they failed in the attempt, or resigned the undertaking into hands of greater practical experience in mechanics, we have not heard, but it is now generally understood, that the extraordinary talents of Mr. M. I. Brunel are devoted to its accomplishment. This gentleman, it appears, has taken out a patent for the invention, and, as the specification is enrolled, we shall lay a full account of it before our readers in the next number of our work. The few particulars respecting it that have as yet been made public, we gather from the pages of that interesting periodical, the Literary Chronicle. The account is given by a correspondent, from whose letter we make the following extract.—

The writer, alluding to Mr. Faraday, of the Royal Institution, says, "I wish I could give you as accurate a description of the machine as he did; but, if I were able, my limits would not permit me; I shall do my best, but, as it is quite new to me, I fear I shall be very deficient.

"There are, then, as I understand, five vertical cylinders, the middle one having a piston, and performing the same part as the cylinder of a steam-engine. But what moves the piston? I have said there are five cylinders. In the two exterior ones, the carbonic acid is confined, and is there alternately in one and the other expanded and condensed, operating, at each alternation, on the piston in the middle cylinder. The mode of operation is thus:—several small tubes pass completely through the exterior cylinders, exposing a great surface to the liquid within, and, by passing through these tubes alternately a hot and cold medium, the liquid carbonic acid is converted into the gaseous, and then the liquid state. Being elevated to the gaseous state, the pressure becomes immense; varying from thirty atmospheres and upwards, many degrees. This pressure existing, there is a connexion from the upper part of the cylinder, by means of a tube, with another cylinder, which is situated between the generator, and the one in which the piston moves. This middle cylinder is filled with oil, and communicates from the lower part to the upper, or under side of the piston, according to the side on which it may be situated. On the surface of the oil is placed a thin piece of wood, fitted exactly to the interior of the cylinder; the gas now entering, presses upon the surface of the pieces of wood, forces down the oil, and so elevates or depresses the piston."

GORDONS' IMPROVED KETTLE.

In consequence of an allusion to this invention, made by a correspondent in our last number, we have been solicitous to lay a description of it before our readers. Accordingly we called at the office of the inventors (No. 33, Cornhill), where we were shewn the article in question, as well as the models of several other culinary utensils, constructed on a similar principle. It consists simply in enclosing vessels of the ordinary kind, such as tea-kettles, stew-pans, &c., with an outer casing surrounding their sides, but open at the bottom, for the flame of a lamp *(such as we shall afterwards describe)* to act upon it. When heat is applied to vessels so constructed, the plate of air between the cases becomes highly rarefied, and the heat, having no tendency to descend, accumulates in the upper part to such an intense degree, as to be capable of melting a rod of glass if passed up the cavity.

In vessels of the usual construction, the greater part of the heated air escapes without producing any useful effect; in these, however, it is detained, and the water may in consequence be boiled in a much shorter space of time. The chief advantages of the new construction are, therefore, economy of heat, or of the inflammable matter employed in producing it, economy of time, and convenience; these will be variously estimated by different individuals, but they must all be more or less favourable to the invention.

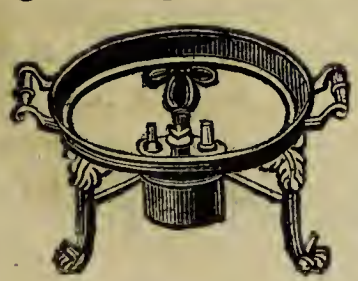
GORDONS' PATENT NAPTHA LAMPS, WITH INCOMBUSTIBLE WICKS.

This very elegant invention of Messrs. A. and D. Gordon was the subject of a patent granted about three years ago; but we do not remember having seen a description of it in any of the scientific journals, except those of a very limited circulation; we have, therefore, considered it right to give it that increased degree of publicity which our humble work enables us to afford. One of the chief characteristics of the invention is the employment of wicks made of metal, glass, and other hard substances, usually denominated *incombustible*, instead of cotton, or other fibrous, spongy, vegetable materials. For this purpose, platina, gold, silver, copper, or glass, is drawn into fine threads, then collected together into bundles, and bound round spirally with wire, or rolled up in a piece of fine wire gauze, forming a cylindrical bandage or covering to each bundle. The wicks thus formed contain a vast number of very minute interstices, arranged longitudinally in parallel lines, and being placed in an inflammable volatile liquid (such as naptha or alcohol), causes it to rise, by capillary attraction, to the upper part of the wick for ignition.

The composition to be burnt in these lamps constitutes another of the principal improvements introduced by the patentee. When alcohol is burned alone, it affords only a pale blue light; on the contrary, when essential oils are burned, they produce a strong light, attended with much smoke, and a considerable deposition of carbonaceous matter upon the wick, but by an admixture of one part of essential oil with five or six of alcohol, a richer and more brilliant light is produced, without any sensible smoke, and unattended with any perceptible deposition.

Alcohol being in this country too expensive for general consumption, the patentees have found a very excellent and cheap substitute in naptha, which is to be combined with an essential oil in the same proportions as with alcohol: the expense of the mixture with naptha is only about one-sixth of alcohol; and it is to be observed, that the essential oils should be such as are easily soluble in the liquid with which they are mixed.

The patentees have had these lamps made up into a great variety of elegant designs, both modern and antique, in gold, silver, bronze, earthenware, and glass. They have also been fitted into frames and stands, to be placed under tea-kettles, tea-urns, coffee-biggins, soup-kettles, stew-pans, sauce-pans, &c. For boiling a kettle of water, on summer mornings and evenings in small families, they have been found extremely convenient; also on ship-board, in camp, in shooting, fishing, and *gypsying* excursions. One of this description we here annex an engraving of, as it is the most generally useful, and of inconsiderable expense. The circular ring at top is for receiving the kettle, or other culinary utensil (which should be made on the plan of the tea-kettle described in the preceding page); the lamp in the centre lies in a frame, and may be taken



out at pleasure, as a distinct apparatus, to afford light instead of heat. The wicks being incombustible, no snuffing, or attention to them during ignition, is requisite; all that is necessary is, to keep the wicks free from dust when not in use, by screwing on the little cap over each wick tube (one of which in the figure is shewn *on*, and the other *off*,) and to put the plug in the central air-hole, as shewn, to prevent evaporation.

IMPROVED MODE OF HOT-PRESSING.

"*To the Editor.*

"Sir,

"It may not be uninteresting to many of your readers, and will doubtless be satisfactory to your correspondent L. H. to learn, that the new mode of hot-pressing proposed by him in the last number of your useful journal, is considered by several practical men concerned in the business of hot-pressing, as an eligible and economical improvement upon the usual method; but there is one apparent defect in his plan, which has perhaps not escaped his attention, yet it is one that is susceptible of several easy remedies, to point out which has been my principal object in addressing you.

"The long slot mortices which your correspondent describes are to be made in each of the hollow cylinders, for the corner pieces of the plates to slide in, *will allow the hot air to escape too freely*. If these were kept closed, the air in the cylinders would become so exceedingly hot, that a very considerably less quantity of fuel would be requisite in the furnace to produce the effect. This may be attained by several simple methods, and until better are discovered, one or the other of the following will probably answer extremely well. Let slips of cork be cut of the width of the mortices, and about an inch longer than their depth, when the plates are secured down; these being inserted into the apertures, will be compressed against the sides by the action of the screw, and make an air-tight closing: a piece of cork to fit each aperture may in this manner be attached by a little chain to each of the corners of the plates, the elasticity of this substance being such as to admit of greater compression than the paper in the press. The next method, which was proposed by a friend, is to adjust a series of sliding plates to the mortices in the inside of the cylinders, which would slide over one another as the pressing plates were screwed up or down, and prevent the free escape of the air. Another mode suggested, is to enclose the whole press in a hot closet, just large enough to contain it, closing the door or front when the press is screwed down. Contrivances, however, will come "as thick as peas" to any body who attempts to overcome this trifling circumstance, when the invention will be complete and effective.

"*Cheapside, Feb.* 14, 1826. "A STATIONER."

History of the Steam Engine.

CHAPTER I. (*continued.*)

Contents.—DR. PAPIN'S EXPERIMENTS—INVENTION OF THE SAFETY VALVE.—SAVERY'S ENGINE; PAPIN'S IMPROVEMENT.

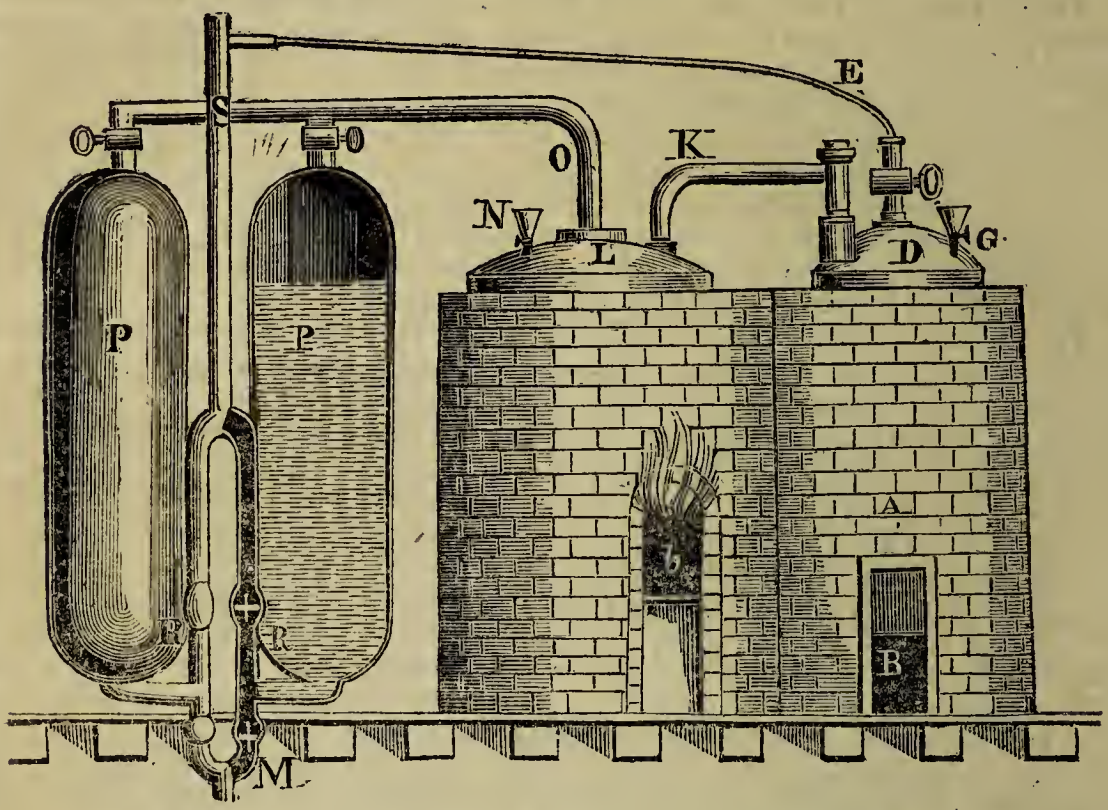
About the year 1680, Dr. Denys Papin, a native of Blois, commenced a series of experiments on the power of steam, which terminated in the construction of an useful and ingenious machine, a description of which we will speedily give. In 1681 he had discovered the method of dissolving bones by steam of a very high pressure, and temperature, and in this invention introduced that simple but inseparable accompaniment of every steam engine, THE SAFETY VALVE. This invention (without which steam would, long 'ere this, have been abandoned as a most dangerous and ungovernable agent) entitles Papin to universal admiration; since it has contributed more than any single addition or improvement to the maturity of the Steam Engine.

The course of Papin's experiments occupied a number of years, and in their progress many ideas occurred to him which have since been adopted as the most important improvements. His earliest project was that of using an air pump, for the purpose of transmitting power to some distance in order to raise water where the first mover could not be conveniently applied. For instance, where a fall of water could be obtained, he proposed to erect a water wheel, which should work an air pump. This air pump he intended to connect by pipes with another pump at the place where the mine was situated. When by the crank on the water wheel the piston of one pump was depressed, the air in the pipes would be condensed, and force up the piston of the other cylinder; and when the piston of the first cylinder was elevated, that of the second would be drawn down by partial vacuum which the elevation produced. This experiment failed even in a model, and Papin directed his studies to the discovery of some means of forming a vacuum under his piston. In 1688 he described a method of effecting this by first displacing the air by exploding *gunpowder*. This he abandoned as dangerous; and, finally, after various experiments and failures, in 1690 he suggested the employment of *steam* for raising the piston, and afterwards forming a vacuum in the cylinder by its condensation. He states—"that in a little water, changed into steam by means of fire, we can have an elastic power like air; but that it totally disappears when chilled, and changes into water, by which means he perceived, that he could contrive a machine in such a manner that with a small fire he could be able, at a trifling expense, to have a perfect vacuum." After noticing the difficulty of making a vacuum by gunpowder, he observes,—"Where there may not be the conveniency of a near river to turn the aforesaid engine, I propose alternately turning *a small surface* of water into vapour by fire, applied to the bottom of the cylinder which contains it: which vapour forces up the plug or piston in the cylinder to a considerable height, and which, as the water cools when taken from the fire, descends again by air's pressure, and is applied to raise water out of the mine."

This, as far as discovery goes, entitles Papin to the merit of having first invented the well known Atmospheric Steam Engine: and, probably, had he followed up the idea by actual experiment, we would have had to record him as the man who first brought it into successful operation: but the greatest merit is not always due to the inventor. Thousands of the most brilliant discoveries have perished for want of industry or talent to foster them. The man who first invents and afterwards struggles through every difficulty, and by the greatest sacrifices and perseverance brings it into actual practice, far outsteps the projector of the most refined contrivance of which history can boast.

Whilst Papin was prosecuting these interesting experiments, a sea-faring man, named Captain Savery, was engaged in England, in endeavouring to bring into notice an engine of his invention, which possessed great merit. The description of his machine was published in a work of his, called "The Miner's Friend." This work is dated 1702, and contains, besides a candid

detail of the principle of his invention, much useful instruction relative to the proper management of his machine. The liberality and honest appeal to experiment which pervades the whole work, forms a rare and striking contrast with the self-sufficiency and conceit which are too generally to be found in productions of this nature. Savery exhibited his model before King William, who warmly interested himself in the project. In June, 1699, he obtained a patent, granting him the exclusive privilege of manufacture. We subjoin a description nearly in the words of the inventor.



"The first thing is, to fix the engine in a good double furnace, so contrived that the flame of your fire may circulate round, and encompass your boilers, as you do coppers for brewing. Before you make any fire, unscrew G and N, being the two small *gauge pipes* and cocks belonging to the two boilers, and at the holes fill L, the large boiler, two-thirds full of water, and D, the small boiler, quite full. Then screw on the said pipes again as fast and as tight as possible. Then light the fire at B, and when the water in L boils, open the cock of the first vessel P (shown in section), which makes all the steam rising from the water in L pass with irresistible force through O into P, pushing out all the air before it, through the clack R, and when all is gone out, the bottom of the vessel P will be very hot; then shut the cock of the pipe of this vessel, and open the cock of the other vessel P, until that vessel has discharged its air through the clack R up the force pipe S. In the mean time, by the *steam's condensing* in the vessel P, a vacuum, or emptiness, is created, so that the water from the well must and will necessarily rise up through the sucking pipe T, lifting up the clack M, and filling the vessel P."

In the mean time, the first vessel P being emptied of its air, open the cock again, and the force is upon the surface of the water, and presses with an elastic quality like air, still increasing in elasticity or spring till it counterpoises, or rather exceeds, the weight of the water ascending in S, the pipe, out of which the water in it will be immediately discharged when once gotten to the top, which takes up some time to recover that power; which having once got, and being in work, it is easy for one that never saw the engine, after half an hour's experience, to keep a constant stream running out the full bore of the pipe. On the outside of the vessel you may see how the water goes out as well as if the vessel were transparent; for as far as the steam continues within the vessel, so far is the vessel dry without, and so very hot, as scarce to endure the least touch of the hand. But as far as the water is, the said vessel will be cold and wet where any water has fallen on it, which cold and moisture

vanishes as fast as the steam in its descent takes place of the water; but if you force all the water out, the steam, or a small part thereof, going through P, will rattle the clack, so as to give sufficient notice to change the cocks, and the steam will then begin to force upon the other vessel without the least alteration in the stream, only sometimes the stream of water will be somewhat stronger than before, if you change the cocks before any considerable quantity of steam be gone up the clack R: but it is better to let none of the steam go off, for that is losing so much strength, and is easily prevented, by altering the cocks some little time before the vessel is emptied."

The ingenious inventor goes on to explain minutely the ease with which his engine could be managed; however, we have quoted sufficient to show clearly the mode of operation. He gives no proportions of the parts, nor is it probable that he himself established any rule, but principally erected his engines by a kind of mechanical tact, which he possessed in a wonderful degree. He seems to have considered that the strength of his machine was the only limit to be observed; "for," says he, "I will raise you water 500 or 1000 feet high, could you find us a way to procure strength enough for such an immense weight as a pillar of water of that height; but my engine, at 60, 70, or 80 feet, raises a full bore of water with much ease."

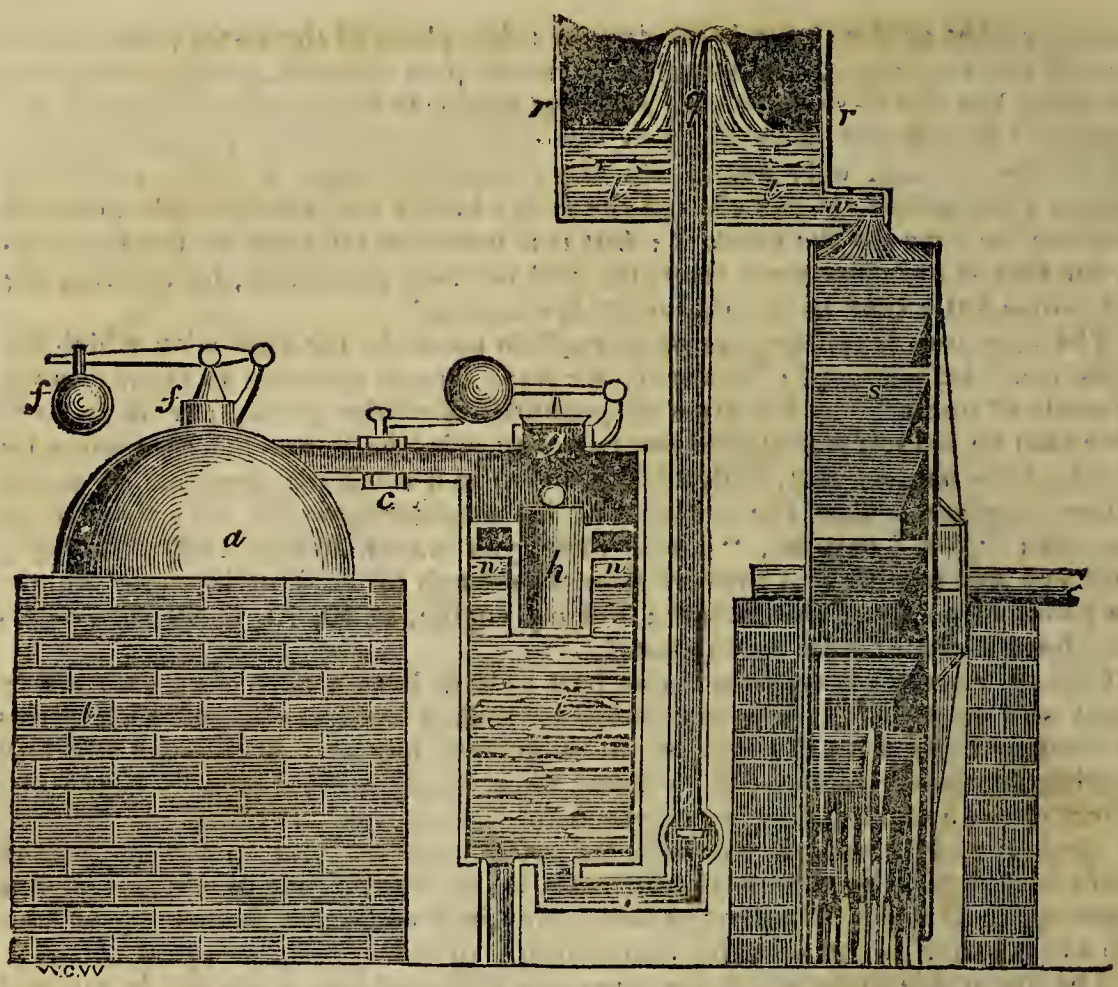
Captain Savery's invention shews him to have been a man of extraordinary talent and ingenuity. The real benefit which it conferred upon society was not alone confined to the reduction of animal labour. It had the effect of enabling ingenious mechanics to direct their energies to a subject which had hitherto been a matter of mere philosophical speculation. It furnished material for study; and though it was adopted with caution, and to a very limited extent by the mining districts; there can be no doubt, but it was the means of sowing those seeds of talent which have since enabled this country to outstep every other in the superior manufacture of steam machinery.

The honorable fame which the invention obtained him could not be enjoyed without detraction: Envious contemporaries were busily engaged in endeavouring to injure, by false accusation, the character which Savery obtained. Desaguliers unequivocably asserts that Captain Savery merely put in practice the Marquis of Worcester's plan for raising water; and, the better to conceal the fact, bought up and burnt all the copies of Lord Worcester's Work on which he could lay his hands."

Stewart, in his History of the Steam Engine, has taken much pains to refute this grievous charge: but we shall merely content ourselves by quoting Dr. Robinson, who says,—"That the account in the Century of Inventions could instruct *no person* who was not sufficiently acquainted with the properties of steam, to be able to *invent the machine himself.*" This opinion may be received without hesitation, since we have shewn that the Doctor maintained that the Marquis of Worcester was, undoubtedly, the inventor of the Steam Engine.

We quitted Dr. Papin to detail the important results of Captain Savery's experiments, which were published in the interim between the commencement and conclusion of those of the ingenious Doctor, who, in 1698, we find still persevering in his project for raising water by steam, under the patronage of the Elector of Hesse. In 1705 he received from the celebrated philosopher, Leibnitz, a drawing and description of Savery's engine (who had seen some of them in operation.) We sincerely regret that Papin ever received this communication, as it has been shewn that he had actually projected a plan which, if carried into operation, would have constituted the Atmospheric Engine, invented by Newcomen. But, unfortunately, the success of Captain Savery diverted his mind from the superior project of forming a vacuum under a piston, and by the command of his patron, the Elector, set about to improve Savery's machine, which is universally allowed to be inferior in effect to the other. The talent of Papin, directed to the Atmospheric Engine, must have produced most important results, which, however, have been lost by the success of Captain Savery's machine.

The consequence of this course of experiment was the publication of a "new method of raising water by the force of fire," dated at Cassel, 1707. He acknowledges that Savery had hit on another mode without knowing his experiments. The following is a description of the machine.



A boiler *a*, made of copper, communicates by a pipe with a cylinder *i*, which forms the body of the pump. This cylinder is attached to an upright pipe *o q*, which enters the cylinder *r r*, rising to within a short distance of its top. This cylinder is air tight, and has a pipe *w*, smaller in its bore than the pipe *o q*. The pipe between the boiler and cylinder has a stop cock at *c*. *f* is the safety valve which prevents the explosion of the boiler, by yielding to the force of the steam, and allowing it to escape when it exceeds a certain pressure, which is regulated by shifting the weight *f* on the lever. Within the cylinder is a piston or float *n*, made of thin plates of metal, forming a part of a hollow cylinder, which floats on the surface of the water.

When a sufficient quantity of steam is generated in the boiler *a*, the cock is opened to allow it to flow into the pump cylinder *i*, forcing the water, which is beneath it, through the pipe *o q*, until it falls at the upper end *q*, into the receiver *r r*, since it cannot flow away through the pipe *w*, so rapidly as it comes in, on account of the pipe *w* being smaller, it rises and compresses the air into the upper part of the receiver. As it escapes through *w*, it issues with velocity on the water wheel *s*, to which it gives motion in the usual manner. When the floater *n* has reached the bottom of that cylinder, the cock *c*, is shut, which prevents the further admission of steam from the boiler, into the pump cylinder, above the floater; and the valve *g* is lifted, to allow the steam above the floater to escape into the atmosphere; a vacuum speedily forms in this space, which is as speedily filled up by water from the mine, through the clack at the bottom of *i*, the clack *o* opening upwards, prevents the column of water in *o q* from descending, whilst the compressed air *r r*, keeps a constant stream on the wheel. When the floater has risen to its proper position, the steam is again admitted on the surface of the floater and drives up the water as before.

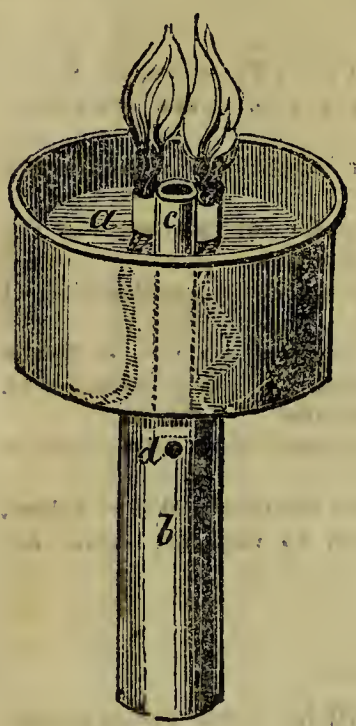
This machine Papin published as the invention of the Elector of Hesse, but it is quite obvious that his disposition to flatter his patron, rather than the regard to truth, caused him to make this statement. We have already expressed our regret that Papin did not persevere in his idea of the *Atmospheric Engine*. As it is, he has shewn himself to be a man of great talent and originality. [*To be continued.*]

SIMPLE LAMP FOR BURNING FAT.

"*To the Editor.*

"SIR,

IN a former number (57) of the Register of Arts, I notice the description of a recently patented invention, by the Hon. E. Cochrane, for a lamp to dissolve and burn fat, and other concrete oily substances. It is now more than twenty years ago that I made a lamp of this kind, by which I burned tallow, dripping, goose-grease, and other solid oily matters, very effectually and conveniently; of the construction of which, I here annex a perspective sketch, should you deem it worthy of a place in your popular and interesting work. It is a simple cottage candlestick lamp, but, lamps on the same principle are capable of being rendered elegant: the addition of a glass chimney would be a great improvement.



"*a* is the fat rendered fluid, lying in the body of the lamp; (the cover of the lamp being removed to shew the interior); *c* is a small tube to convey air into the middle of the flame (to perfect the combustion, on the principle of the argand burner); this tube opens at the lower end into the large tube *b*, as shewn by dots; a small perforation is also made at *d*, to allow the air to flow freely into the tube *c*, when the lamp is fixed in the socket of a candlestick. On each side of the air tube a short piece of copper pipe is fixed by hard solder, for holding the cotton wicks; (these tubes (which ought to be longer) get intensely hot, and, by the conducting power of the metal, the heat is transmitted to the fat, which, melting in consequence, flows up the wick like fine oil, but infinitely preferable, on account of its diffusing no unpleasant smell during the combustion.

"*Pentonville.* "Your constant Reader,

"*February* 14, 1826. "D. H."

THE MENAI BRIDGE.—The chain bridge just finished over the Menai ferry, and opened within the last few days, it perhaps (with the single exception of the Simplon Road) the most stupendous monument of human art in the whole world; and places Mr. Telford's name on the very proudest elevation of professional fame. The sea rushes in a dark and turbulent confusion of currents between the precipitous shores of Anglesea and the main land; many small rocks partly hidden except at low water, augment the perplexity and danger of the passage; the winds blow furiously down the ravine, and produce even when the weather is moderate elsewhere, a perfect tempest of spray. Altogether, except in the first season of the year, the old

Menai ferry was a sufficient trial for not the weakest of nerves. The narrowest part of the straight is 500 feet in width, and here it is now crossed by a convenient bridge 30 feet in breadth, suspended 100 feet above the surface of the water, from enormous stone buttresses 152 feet in height.—*Literary Gazette.*

LETTERS OF ENQUIRY.

Essential Oil of Walnuts.—M. S. is desirous to be informed of the process to be adopted for obtaining the *essential oil* of walnuts.

Varnish.—An Artist wishes to learn the process of making a *colourless* spirit varnish.

LIST OF NEW PATENTS.

INLAND NAVIGATION.—To H. A. Keymans, of Warnford Court, Throgmorton Street, for improvements in the construction and use of apparatus and works for inland navigation. Jan. 16. Six months.

SPINNING.—To J. F. Smith, of Chesterfield, Derbyshire, for improvements in the process of drawing, roving, spinning, &c. Jan. 19. Six months.

CULINARY UTENSILS.—To W. Whitfield, of Birmingham, for improvements in the making of the handles for saucepans, kettles, &c. Jan. 19. Six months.

HINGES.—To Benjamin Cook, of Birmingham, for improvements in the construction of hinges of various descriptions. Jan. 19. Six months.

APPLICATION OF STEAM.—To A. R. Lorent, late of Gottenburg, but now of Queen Street, Cheapside, for a new method of applying steam to pans, boilers, coppers, stills, pipes, machinery, &c. and regulating the same. Jan. 19. Six months.

MASTS.—To Sir Robert Seppings, of Somerset House, for an improved construction of masts and bowsprits. Jan 19. Two months.

AXLE-TREES.—To Robert Stephenson, of Bridge Town, Old Stratford, Warwickshire, for improved axle-trees to remedy the extra friction on curves to waggons, carts, &c. Jan. 23. Six months.

TO OUR CORRESPONDENTS.

W. B. Junr's. Paper *we* have never seen; search will be made for it at the Publisher's.

A. Z. will find, in our 55th number, that a correspondent has anticipated him by a similar communication: we much fear that his new instruments would be too troublesome to become of any practical advantage.

We know not what to say, *in this place*, to our old friend Adolescens. He presupposes that a vacuum can be effected (as was too generally supposed) by the means alluded to, but it unfortunately turns out to be otherwise, or to only a very partial extent. There has been no difficulty experienced in simplifying the mechanical arrangements, and these have availed but little, as the defect is owing to a chemical cause; and until this defect is remedied, the publication of any improvements in the mechanism would appear ridiculous.

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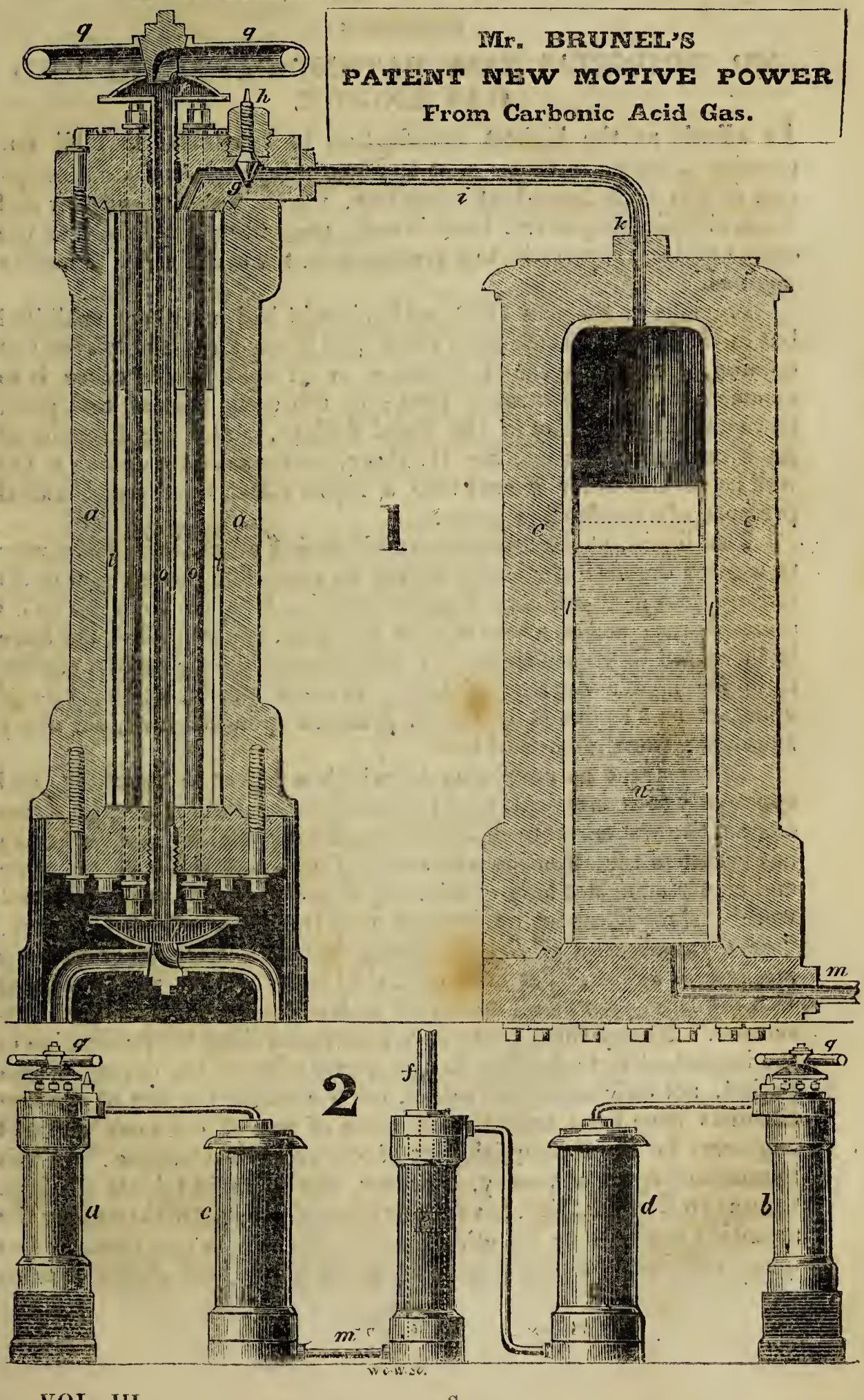
REGISTER

OF

THE ARTS AND SCIENCES.

No. 65.] SATURDAY, MARCH 11, 1826. [Price 4*d*.

Mr. BRUNEL'S PATENT NEW MOTIVE POWER From Carbonic Acid Gas.



CONTENTS:

Mr. Brunel's Patent New Motive Power from Carbonic Acid Gas 258
Taylor and Martineau's Improved Steam Engine, ... 260
Ridgeway's Patent Porcelain Cocks or Taps 261
Fisher's Patent Railway and Carriages, .. 263
On the useful effect of Fire Engines.. ... 264
History of the Steam Engine, Chap. I. .. 266
MISCELLANEOUS.—Magnetic Power of the Violet Rays of Light, 269,—French Loco-motive Carriage, 270,—Compression of Air and Gaseous Bodies, ib.—&c. &c.—Patents, &c. 272.

MR. BRUNEL'S NEW PATENT CARBONIC ACID GAS ENGINE.

It affords us the highest gratification to be enabled to fulfil our promise of giving in the present number, a full and accurate description of this truly important invention, which, from its superior and almost illimitable powers, there is every probability that it will in the course of time, supersede, to a great extent, the use of *steam* in motive engines.

Previous to the year 1823, carbonic acid had never been exhibited but in the gaseous or aëriform state, and it was a commonly received opinion, that no degree of pressure, or of cold, would cause it to assume a more concentrated form; in the early part of that year, however, Mr. Faraday of the Royal Society, under the direction of its illustrious president, Sir H. Davy, succeeded in reducing it (as well as several other gases) into a liquid state, by the mechanical pressure of a condensing pump.

This liquid, at the temperature of freezing water, in its endeavour to assume the aëriform state, exerts an expansive force equal to 30 atmospheres; at ordinary temperatures, a force of from 40 to 50 atmospheres; and on a heat of only 120° Fah. being applied, the force is increased to 90 atmospheres; the pressure increasing in a similar ratio for higher degrees of heat; in other words, at the rate of about 11 or 12 pounds increased pressure upon the inch, for every single additional degree of heat.

To construct an apparatus by which a power so immense, and apparently so economical, might be rendered available, like the steam engine, as a first mover to all kinds of machinery, we may easily conceive has occupied the attention and study of many of the most scientific and clever men, not only of this, but of every country in the civilized world; since it cannot be doubted that the paper of Sir H. Davy, "*on the application of liquids formed by the condensation of gases as mechanical agents,*" has been published every where, and translated into the languages of all countries where mechanics is studied as a science. Nearly three years have intervened since the publication of the important facts detailed in the paper alluded to, during which period, not only individual talent, but the abilities of one of our first chemists have been united with those of one of our most eminent engineers for the accomplishment of this great desideratum. In this honourable spirit of rivalry, however, the splendid talents of Marc Izambard Brunel, Esq. have shone triumphant; notwithstanding the attention requisite to his other great works now in progress, he has found the time, and the means, by a few simple and admirable com-

binations, to outstrip in the career all his contemporaries; and to present to the world the first carbonic acid or expansive gas engine.

It is proper that we should here remark that the patent right for Mr. Brunel's apparatus is not limited to the employment of carbonic acid, but that it extends to all liquids which are the result of the condensation of the gases. The preference being however given to the former, we may perhaps infer that the engine we have to describe is better adapted to the peculiar properties of carbonic acid gas than to those of the others. Carbonic acid gas may be obtained by decomposing any of the carbonates by the action of the common acids. The mode of obtaining the liquid from the gas is by forming the gas under a gasometer, and condensing it afterwards in another vessel by means of a condensing pump, and continuing the operation until it passes to the liquid state.

The apparatus, as shewn at *fig.* 2, consists of five distinct cylindrical vessels; the two exterior vessels *a* and *b* contain the carbonic acid reduced to the liquid form, and are called the *receivers*; from these it passes into the two adjoining vessels *c* and *d*, termed *expansion vessels*; these last, having tubes of communicaton with the working cylinder *e*, the piston therein (shewn by dots) is operated upon by the alternate expansion and condensation of the gas, giving motion to the rod *f*, and consequently to whatever machinery may be attached thereto.

As the working cylinder *e* is of the usual construction, no further description of that part of the apparatus is necessary; and as the two vessels on one side of the cylinder are precisely similar to those on the other, a description of the receiver *a* and the expansion vessel *c*, will apply to their counterparts *b* and *d*; the two former (*a* and *c*) are therefore given in a separate *fig.* (1) on a larger scale, in section, that their construction may be seen and their operation better understood. The same letters of reference designate the like parts in both figures.

The communication of the condensing pump (before-mentioned) with the receiver *a* is through the orifice *g* which can be stopped at pleasure by the plug or stop cock *h*. When the receiver has been charged with the liquid and closed, a pipe *i* is applied to and connected to the expansion vessel *c* at *k*. *l l* is a lining of wood (mahogany) or other non-conductor of heat, to prevent the absorption which would otherwise be occasioned, by the thick substance of the metal. The expansion vessel is connected through a pipe *m* to the working cylinder *e*; these vessels contain oil, or any other suitable fluid, shewn at *n*, as a medium between the gas and the piston.

The receiver is a strong gun-metal vessel, of considerable thickness, in the interior of which are placed several thin copper tubes as represented at *o o o*; the joints of these tubes through the top and bottom of the receiver are made perfectly tight by packing. The use of these tubes is to apply alternately heat and cold to the liquid contained in the receiver, without altering very sensibly the temperature of the cylinder. The operation of heating and cooling through the thin tubes *o o o*, may be effected with warm water steam, or

any other heating medium; and cold water, or any other cooling medium. For this purpose the tubes *o o o* are united by a chamber and cock *p p*, by the opening of which, with the pipes *o o*, hot and cold water may be alternately let in and forced through, by means of pumps, the cocks being worked in a similar manner to those in steam engines.

Now if hot water, say at 120°, is let in through the tubes of the receiver *a*, and cold water at the same time through the receiver *b*; the liquid in the first receiver will operate with a force of about 90 atmospheres, while the liquid in the receiver *b* will only exert a force of 40 or 50 atmospheres. The difference between these two pressures will therefore be the acting power, which through the medium of the oil, will operate upon the piston in the working cylinder. It is easy to comprehend that, by letting hot water through the receiver *b*, and cold water through the opposite one *a*, a re-action will take place, which will produce in the working cylinder *e* an alternate movement of the piston, applicable by the rod *f* to various mechanical purposes as may be required.

It is to be observed, that the use of the gasometer and of the forcing pumps is simply for obtaining the gas, and for charging the receivers with the liquid. When the receiver is once charged, and has been closed with the stop cock *h*, the gasometer and forcing pumps are to be disconnected from the receiver by unscrewing the pipe *i* at the joint. The same pipe may however be used as the means of connecting the receiver with the expansion vessel; the adoption of two distinct pipes for these purposes is intentionally avoided, as it would become necessary in consequence to have two orifices as well as two stop cocks. It is obvious that no difficulty exists in connecting the forcing pump with both receivers, as the small pipes used for that purpose may be made to reach either.

The most essential parts of this interesting invention, are; the internal application of the tubes for conveying the heating and cooling medium; the cylindrical form, and the manner they are applied rendering them capable of resisting the intense external pressure of the liquid, yet admitting of their being made so thin as to allow of the rapid and complete transmission of heat and cold through them: and the arrangements by which the receivers acting in opposition to each other produce, without any aid of intermediate valves, an alternating action, attended with scarcely any perceptible diminution of power from friction, the force being so great, that it may almost be deemed irresistible.

TAYLOR AND MARTINEAU'S IMPROVED STEAM ENGINES.

From the extensive adoption of Messrs. Taylor and Martineau's horizontal steam engine, we doubt not that most of our readers are acquainted with its construction, and have, like us, frequently admired its uncommon compactness, and very convenient arrangements. Yet, notwithstanding it possesses advantages of an unquestionable nature, the horizontal position of the cylinder has been

looked upon very generally as productive of a great evil; namely, the unequal wearing of the cylinder, owing to the weight of the piston pressing upon its lowest side. With a laudable spirit for improvement, however, Mr. Philip Taylor (of the above mentioned firm) has recently taken out a patent for "improvements in steam engines," in which it is obvious his chief object has been the remedying of the evil just mentioned.

In the improved engine, the piston rod is made to pass through the piston and through both ends of the cylinder, the latter being provided with stuffing boxes; and the ends of the piston rod are supported by vertical wheels moving between guides. To overcome the flexibility of this long rod owing to the pressure of the piston in the middle, an *attempt* is made to produce in this massive bar a state of tension, by loading each end with a sufficient weight, appended to a bent lever; which weights it is considered may be dispensed with *when* an engine is employed in pumping, so that no diminution of power may result from this circumstance.

The patentee likewise proposes to employ two or more cylinders, placed horizontally and parallel to each other, so as to combine their action and unite their powers. This is to be done by connecting the piston rods to a suitable framing of metallic bars, which are to run upon vertical wheels, between guides, as in the former case.

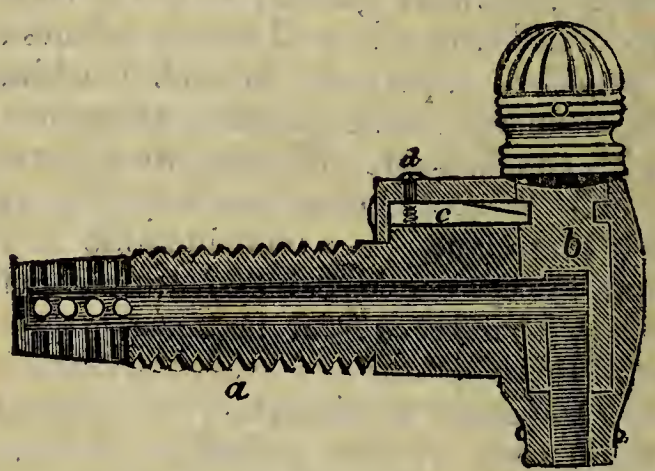
It may be presumed from the well known talents of the patentee, and his great practical experience in such machinery, that some advantages of importance are to be gained by these new arrangements; it is therefore with considerable diffidence we observe, that they are not apparent to us. Without going into any nice calculations, we may remark, that there must be a considerable loss of power, by increased friction, in the employment of *several* cylinders, instead of *one, of the sum of their areas:* for instance, we shall find that the sum of the areas of three pistons of 9 inches in diameter, is not equal to the area of one 16 inches in diameter; consequently their united power is *less,* while their friction is *double* (all things considered) and the cost *more.* Of these facts there can be no doubt the patentee is fully aware; and we cannot discover what advantages the new arrangements offer, which will compensate for these manifest disadvantages.

With respect to the length of the piston rod being doubled, we take leave also to submit, that it is but a slight palliative for the evil complained of, and upon the whole no improvement. At any rate we greatly prefer the engine as previously constructed, on account of its superior convenience and simplicity. The objection urged against it, on account of the irregular wearing of the piston and cylinder has not much weight with us, because we think, that if an expanding metallic piston be judiciously constructed, it will constantly adapt itself to the alteration of figure produced by the wear, so as to keep tight for several years: at the same time we must of course be understood, as admitting it to be an imperfection, necessarily resulting from the horizontal position.

RIDGEWAY's PATENT PORCELAIN COCKS OR TAPS.

To construct a cock or tap for the drawing off of liquids, to act well, of a material not subject to corrosion, and capable of bearing the blows and percussions to which they are liable, has been long felt as a desideratum in this branch of art. To effect so desirable an object, Messrs. J. and W. Ridgeway, of the Staffordshire Potteries, have invented and taken out a patent for an elegant and substantial apparatus of the kind, made of the strongest porcelain, or stone ware. The earths employed to produce the composition are similar to those in general use for the manufacture of porcelain, consisting for the most part of alumina, silex, quartz, and granite. The materials being ground, mixed, and made into a paste, the several pieces of which it is made are moulded and cut to the required shapes; the circular parts are turned in a lathe, and those of a tubular form bored and turned by similar means. The parts are joined together by moistening the junctures, afterwards baked and vitrified.

The forms of the cocks are somewhat new, as well as their interior construction; the annexed diagram gives a section (excepting the upper or handle part of the plug) of the form most approved of by the patentees: *a* is the long tube, with a screw thread cut upon its external surface for the purpose of being screwed into the barrel;



b, the plug, accurately ground and fitted into its place, in which a vertical perforation is made, by boring, so as to form a channel for the liquor, of equal diameter to that in the long tube *a*; the plug is then bored horizontally, so as to open a communication with the vertical perforation, and also with the long tube when the plug is turned in the direction shewn for drawing off the liquor. To secure the plug in its place, and produce a uniform action, it has a groove made three quarters round it, for receiving the end of the bolt *c*, which is fastened by the screw *d*.

The patentees have likewise described in their specification a "lock-cock," of which we give no figure, as it will be seen, by the construction of the above, that such an application is easily made. Under the bolt which keeps the plug down in its place, is fitted another bolt with a spring (like those in common cabinet locks), and under this bolt a hole is made for the insertion of the key, which projects the bolt into a mortice hole in the plug; this hole being only open to the bolt when the liquor is turned off, the latter may thus be secured from depredation.

FISHER'S PATENT RAILWAY AND CARRIAGES.

This invention, is the subject of a patent granted to Mr. Jacob Jeddere Fisher, of Ealing, Middlesex. The object appears to be the throwing of a rail road across rivers, ravines, swamps, &c; the means of effecting it will be readily perceived, upon inspection of the annexed figures.

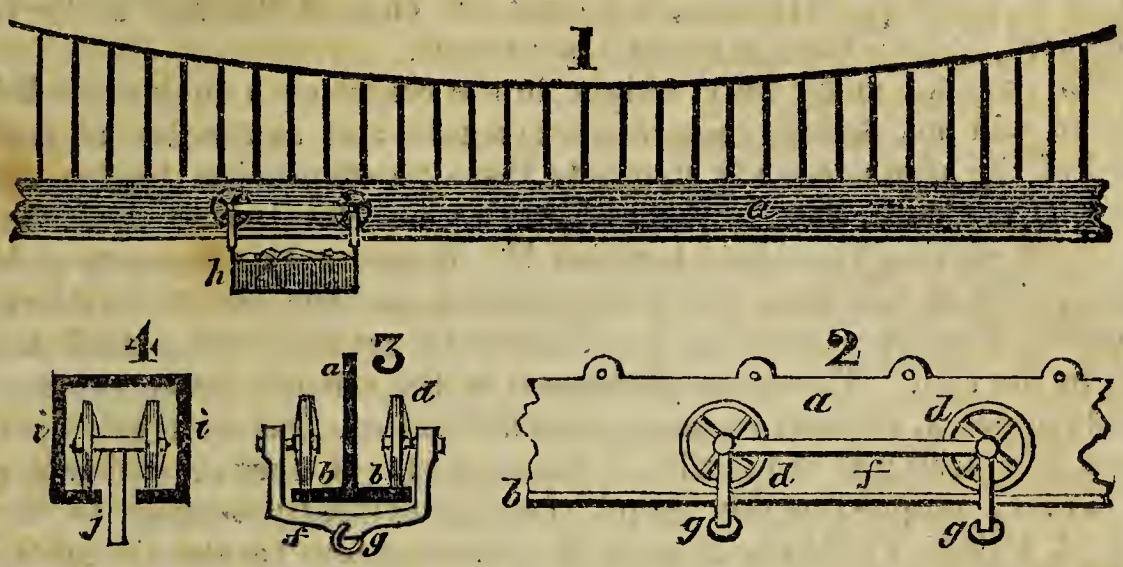


Fig. 1, is a side view of the proposed rail attached by vertical rods, to a chain of bars which form a catenarian curve; *fig.* 2, is a similar view, but giving only a portion of *fig.* 1 on a larger scale; *fig.* 3, is an end or sectional view of *fig.* 2; *fig.* 4, is also a sectional view, but of another form of rail, which we shall describe lastly. The letters of reference denote similar parts in each of the figures.

a is the rail made of stout cast iron plates of uniform dimensions, bolted together; having a horizontal projection, or plate *b b* on each side, for the wheels of the carriages *d d* to run upon, (seen best in *fig.* 3); *f f* shews the frame of the carriage; the manner of connecting the wheels on either side of the rail in pairs, is exhibited in *fig.* 3, and the mode of joining the front with the hind pair of wheels, in *fig.* 2. Iron rings *g g*, pass through the centres of the lower parts of the carriage frame, to which are suspended the boxes or receptacles for holding the goods or passengers, one of which is shewn attached at *h*, *fig.* 1. The loops or holes in the upper part of the rail *a*, *fig.* 2, are of course, for the convenience of bolting it to the suspension bars, as seen connected in *fig.* 1. Each of the bars is to be provided with a wedge or screw adjustment, so as to regulate the uniformity of the plane, when any part sinks.

To give an idea of the other form of rail, we have thought the section, *fig.* 4, sufficient. Here it will be seen, that the rail (if we may so term it) is of the form of a square tube or hollow trunk *i i*, with an opening or slit on the lower side; for the bar *j* (which is fixed to the axle-tree of the carriage) to pass through, for the purpose of being connected to a box or receptacle underneath. This square cast iron trunk or rail, is to be suspended as in the previously described rail, to a chain of iron bars or wires, drawn nearly tight, so as to form a catenarian curve, when stretched over the place to be crossed.

The manner in which the carriages are to be *propelled* on the rail no notice of whatever is taken in the specification; but we have been informed, that it is intended by the patentee, to erect his rail-way upon a horizontal plane, and when the carriages are brought upon it, *that end upon which they are situated* is to be elevated, so as to give a slight inclination to the plane, when the carriages will roll over to the *other end* by their own gravity; and when the traffic is in a contrary direction, the opposite end of the rail is to be elevated, to produce the reverse movement.

To suspend many tons weight in the centre of a long extended chain, will necessarily require attachments and abutments at each end of the chain, equally strong to that of a suspension bridge. If this be the case, how is the rail way to be elevated or depressed without moving the whole together ?* Suppose this however to be done, that an adequate power is obtained, and the *cost* of no consequence, another power will be required to get the carriages off and on to the rail. The accomplishment of the scheme on an *extensive* scale appears, indeed, so beset with difficulties, that we much question ever seeing it in practice. Some parts of the invention are, however, unquestionably good, (which evidently belong to Mr. H. R. Palmer's patent rail-way, described in our seventh number,) but their value is lost by the mode of application.

Like Mr. Palmer's, the weight is suspended to the axle trees of the carriages, with the centre of gravity always below the surface of the rail; but instead of having a single rail upon vertical supports, Mr. Fisher proposes to have a double one, with the supports farther removed from each other. That the idea of a double rail-way on the suspension principle is not novel, may be easily seen by reference to Mr. Palmer's work, (entitled "*Description of a Rail-way upon a New Principle,*" Published by Taylor, Holborn, 1823.) At page 35, Mr. P. says, "*To elevate two lines of rail for the purpose of supporting a carriage, could not be accomplished at a sufficiently moderate expence; I therefore endeavoured to arrange the form of a carriage, in such a manner that it would travel upon a single line of rail, without the possibility of overturning.*" Mr. Fisher's modification therefore, appears to us, to be composed for the most part of a rejected proposition of Mr. Palmer's, together with a valuable portion of that gentleman's patented invention; and it further appears to us that a *decomposition* must take place before any practical advantage can be derived from it.

ON THE USEFUL EFFECT OF FIRE ENGINES.

"Sir,

"Observing a Letter inserted in No. 62, of your Register, now before me, on 'The United Forces of Fire Engines,' I am

* Since writing the above, a possible way of effecting this movement has occurred to us: it is to attach or make fast the upper line or chain, and to allow the rail or road way to be simply suspended by vertical chains, with the extremities of the rail way a few feet above the ground; either end of the rail way may then be elevated, and the carriages got on, by suitable machinery. A ditch might then be crossed, or even the *New River*, of which the patentee is, we believe, a large proprietor: but to attempt, as contemplated, the crossing of broad rivers and ravines, reminds us forcibly of the schemes of our old friend, Baron Munchausen.

induced to trouble you with my observations on the subject; especially as your Correspondent, E. W., with many more, among whom was formerly myself, has formed an erroneous opinion on the subject. I have for some time attended nearly all the fires which have happened in the metropolis, both the large ones, and also those which have been subdued by the active exertions of that worthy and meritorious class of men, the firemen. Now it happens, that in those cases, in which this dreadful element is overcome by the firemen, instances to which I have myself been witness many times within these few months past, instead of being held up as worthy of public admiration, are unknown, save to those persons residing in the immediate vicinity of the accident; whereas those accidents which, from their distance, want of water, or (which is more frequently the case), from the fire having gained too much head before the alarm is given, baffle for a short time all efforts to subdue them, find their way into the public prints (and not unfrequently accompanied with animadversions on those persons who have ventured their lives and limbs for the public safety); this being the case, people suppose the apparatus inefficient, or the firemen negligent, and your Correspondent, E. W., is of the former opinion; whereas, I maintain, and I do not stand alone in my assertion, that from the perfection attained in the construction of the present fire engines, and the judgment displayed in their direction, they are quite equal to any thing likely to be required of them. With regard to lofty buildings, I have been present at fires in the highest houses, but on no occasion was the fire above the reach of the water; the Shot Factory, to which E. W. alludes, was an exception, and one which very rarely occurs: the firemen sometimes gain an elevation by carrying the hose to the tops of the neighbouring houses. But I will now proceed more particularly to the point in question. Your Correspondent proposes to unite the hose of two engines, by which means he will assuredly '*gain a loss*;' for reckoning the power of each engine separately as 4, the two united will not amount to more than 6, for it is height of water which he considers desirable; perhaps he is not acquainted with the extreme force necessary to sustain the column of water which he supposes would be the result of this union. The pressure, when the column of water is sixty feet high, is equal to twenty-eight pounds on every square inch of the surface of the engine exposed to its action. If he was to increase the bore of the branch, he might throw a larger column of water to the ordinary height, but this is a decided disadvantage, and I have been very industriously circulating the contrary opinion, supported by experiment, that if each engine was to play from two branches, that should enable a smaller column of water to attain the same elevation, they would produce more effect on the fire than one large column as at present; there is an insurmountable obstacle to throwing a column of water to any great height, in the resistance of the air, which, if the velocity be great, will divide it into minute particles, and completely destroy the motion it had acquired on leaving the branch of the engine.

"I have read with the greatest pleasure, '*An Account of Experiments, shewing that violent Conflagrations may be extinguished by*

'*small quantities of water*,' by M. Van Marum, from the Annales de Chimie; which may be found in the 3rd Vol. 2nd Series, of Repertory of Arts, page 461, and which fully bears me out in my opinion, that it is the surface that can be covered by a given quantity of water, and not the quantity of water that can be thrown upon a given surface, that is the desideratum in fire-extinguishing machinery.

"Hoping that your Correspondent will pardon the liberty I have taken with his communication, as it is of the greatest importance that we should all possess correct ideas on this most important subject.

"I remain, Sir,

"10, *George Yard, Lombard-street,* "Your's respectfully,

"*Jan.* 31, 1825. "W. B. Jun."

History of the Steam Engine.

CHAPTER I. (*concluded.*)

Contents—NEWCOMEN'S EXPERIMENTS.—HUMPHREY POTTER.—BEIGHTON'S IMPROVEMENTS.

We have already observed that the beneficial effects of Savery's invention were not confined to the reduction of animal exertion. This, though a grand, was not the principal result which arose from its introduction; for the great danger, or more probably *fear*, of explosion, tended to counteract its general adoption. We say, therefore, that the greatest benefit which it created was that of familiarising all mechanics with the nature of steam; its elasticity when heated, and its "*sucking power*" when cooled: and when Savery's engine was found inadequate to the proposed end, ingenuity was on the alert to apply these in some more efficient manner. This feeling found its way to the ancient town of Dartmouth, in Devonshire, and drew forth the attention of Thomas Newcomen, a blacksmith. This man, though possessed of no scientific knowledge, was endowed with a clear head, and great inventive powers. He had been, from his childhood, fond of amusing himself with little mechanical combinations, which obtained him among his friends and companions the title of a "*schemer.*" We are informed that he had seen one of Savery's engines, when he conceived the possibility of obtaining power in a manner similar to that proposed by Papin in his first project, namely, by a water wheel working two air pumps. He was so completely convinced of the feasibility of his plan that he applied to Dr. Hooke on the subject, who, it appears, dissuaded him from the prosecution, adding this remarkable and important suggestion, "If you could make a *speedy vacuum* in your second "cylinder your work is done."

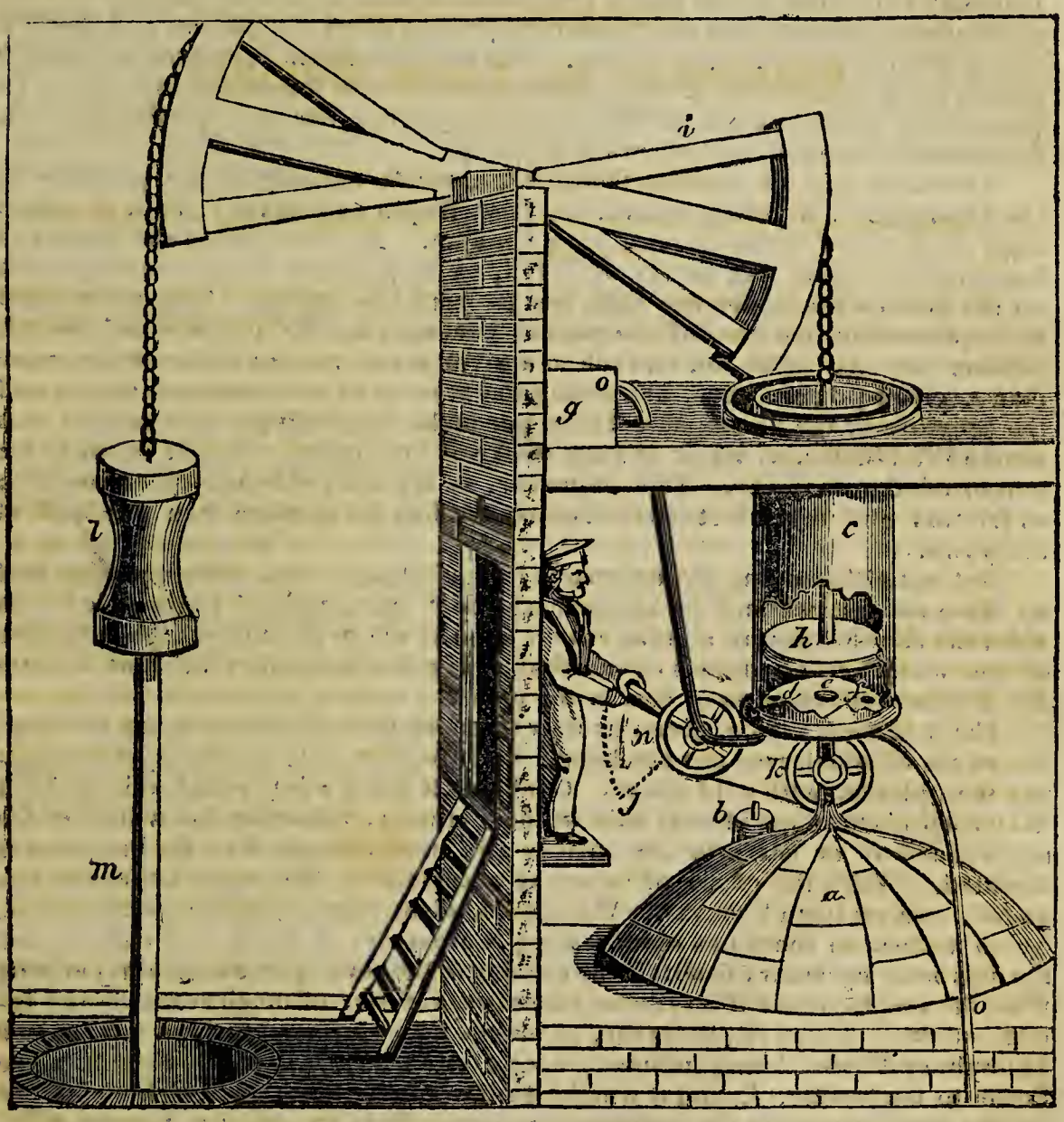
Newcomen, we are informed, was for some time engrossed with the new train of ideas to which this hint led him, till at length he conceived the "*sucking and forcing*" power of *steam* would, in every respect, answer the end, and this brilliant thought he communicated to his friend and fellow-townsman, John Cawley, a glazier. By joint study and exertion they soon satisfied themselves of the practicability of the scheme, and constructed the machine upon a small scale. It is not known in what manner this model was made, but we may easily imagine a very simple and cheap one could be formed by the use of a common syringe; and to such of our readers as would wish to understand thoroughly, the principle of the atmospheric engine, we recommend the following experiment:—

Into the perforation of a small glass globe, partly filled with water, introduce the mouth of a common syringe. Form a luting round the joining so as to render the joint good and tight. Apply this to the flame of a lamp, and as soon as the water boils, the steam formed thereby will force up the rod of

the syringe to the top: immerse the whole in cold water, and the rod will as speedily descend. Apply the lamp again and the rod will again be raised, and upon plunging it again into cold water it will descend as before; these motions may be repeated *ad infinitum*.

Newcomen and Cawley being assured of success, were about applying for a patent, when Savery claimed the invention as his, on the ground that the method of procuring a vacuum by steam was his discovery: they were, therefore, obliged to allow his name to be associated in the grant which they obtained in 1705.

We present our readers with a novel drawing of Newcomen's engine; we are not aware that such a machine was ever in operation; but we have been favoured with the drawing by a friend, who informs us that the original bears date 1720, fifteen years after the patent was obtained. As it represents some of the parts in a singular form, and shews clearly the mode of operation, we shall offer no apology for using it in our explanation.



a represents the boiler, of which *b* is the safety valve, being a weight placed on a clack, which yields to steam above a certain pressure, and prevents explosion. *c* is the cylinder, open at the top, having three holes at the bottom, *d e f*. The hole *e* admits the steam from the boiler; the hole *d* admits a jit of cold water from the reservoir *g* in order to expedite the condensation of the steam. *f* is a pipe for the exit of the condensed steam, and to get water from the cylinder. *h* is the piston or plunger, whose diameter exactly fills the area of the cylinder. It is packed or stuffed on its edge, so as to preserve the vacuum as perfect as possible; *i* is the beam, or (as it is called in some

of the coal districts) the *loggerhead*, for the purpose of communicating the motion of the piston to the pumps in the mine.

A sufficient quantity of steam is first formed in the boiler when the boy pushes the handle or lever which he holds down to *j*, which, by the wheels and band, opens the cock *k*, and allows the steam to enter the cylinder. The steam being only sufficient to equal the pressure of the atmosphere, will not of itself lift the piston and loggerhead; it is therefore necessary that some means should be adopted to aid it in its ascent. This is done by means of the weight or counterpoise *l*, so that by the force of the steam and gravity of the counterpoise, the piston is elevated to the top of the cylinder, and forces down the pump rod *m* into the pump in the mine. When this is effected, the boy returns the handle to its original position (shewn in the drawing) which prevents the admission of more steam from the boiler, and at the same time opens the cock *n*, so as to admit a small quantity of cold water from the reservoir *g* into the cylinder; this, by dispersing itself among the steam in the cylinder, almost instantly condenses it, so that a vacuum is obtained, and the pressure of the atmosphere meeting with no resistance, presses down the piston, and thereby raises the pump bucket in the mine. The handle is again depressed to *j*, which allows fresh steam to enter the cylinder, and elevate the piston as before. To prevent the accumulation of water in the cylinder the cock of the pipe *n* is occasionally opened, and allows it to escape.

The force of this engine, therefore, consists entirely of the pressure of the atmosphere, differing essentially from Papin and Savery, both of whom used the force of steam as well as a vacuum. By this method the danger of bursting the boiler was nearly obviated, as the pressure of one or two pounds on the inch on the boiler was sufficient to work the engine. The power must be regulated by the area of the piston, because, as the pressure of the air seldom exceeds 14¾lbs. on an inch in a given area, we can never obtain more than a given power: thus, supposing the area to be one hundred inches, and the pressure of the atmosphere 14lbs. per inch, the pump piston would at each stroke lift 1400lbs. of water at each stroke of the engine, a height equal to the length of the cylinder. This, however, is far above the real performance: as friction and imperfect condensation seldom leave more than one half of the power.

But notwithstanding the enormous loss of steam, and, consequently, fuel by these causes, we find the atmospheric or "*open topped*" engine used with different modification to a great extent even at the present day. The expence of the *double acting* engines counterbalancing in the opinion of coal owners the greater consumption of fuel in the other.

The engine we have given contained many improvements upon the first, the steam of which was not condensed by injection, but merely by surrounding the cylinder with cold water. Condensation by a jet is said to have been discerned from an accidental hole in the cylinder, allowing the water which surrounded it to get into the inside, and thus the speed of the engine was doubled. When the cause of this was ascertained, the injection cock was added, as a matter of course. We should, also, state, that the machine was, by no means, so simple as our drawing represents; a number of catches and springs being necessary to obtain the changes of the cocks; the uncertainty arising from the employment of boys was, likewise, a matter of much vexation and inconvenience. This evil, however, produced its own remedy; for a boy, named Humphrey Potter, being inclined to *scag*, or skulk, fastened a cord from the beam to the handle, *j*, and a weight to the handle also, by which means the engine itself produced the necessary motion. This he called a "scaggar."

With this addition Newcomen's engine approached very nearly to a self-acting one; but still the turning of cocks and filling of reservoirs was obliged to be in part left to careless men, and as the precision of the work depended upon these, frequent derangement was the consequence; until Mr. Henry Beighton, of Newcastle-upon-Tyne, constructed what he called the hand gear, whereby motion was given to all the cocks and levers, by a rod from the beam. This engine was erected in 1718, and, besides the improvement mentioned, it was the first engine in which a *steel-yard* safety valve was used.

After the improvements of Beighton little remained to be done to the At-

mospheric Engine, most of the difficulties peculiar to its construction having been overcome. We should except, however, one great evil, and that was the frequent destruction of the boiler and cylinder. This was owing to the position in which they were placed, for the piston striking against the bottom of the cylinder, frequently shook the boiler in a few days so as to completely loosen it from the brick work, and the reversion of the beam produced a violent pull in the opposite direction. The writer has seen one of these engines near Newcastle, where the top of the boiler rose and fell at least half an inch at each reversion of the stroke. This difficulty was obviated in a tolerable degree, by placing the cylinder *beside* the boiler; and, thus modified, Newcomen's engine is used all over the kingdom.

We cannot conclude this Chapter without expressing the veneration which we feel for the memory of the immortal Newcomen. We are bold to say (and we know, in saying this, we differ from abler and better historians) that Thomas Newcomen did more for the Steam Engine than any one individual that ever contributed to its improvement. We except none,—Watt, himself, and in the mention of that name we feel the profoundest humility,—Watt sinks into comparative insignificance when compared with Newcomen. For, whether we value the genius of a man by the extent of its utility, or by the difficulties which it encounters, and over which it triumphs, we are alike bounden to place the name of Newcomen first among those which have been the boast of our country.

[*To be continued.*]

Discoveries & Processes in the Useful Arts.

Magnetic power of the Violet Rays of Light.—One of the most interesting papers (and by far the most important, as respects the useful arts) read at the recent meetings of the Royal Society, was from the pen of a lady, (Mrs. Mary Somerville), in which the ingenious authoress described a series of experiments, tending to prove a most curious fact; viz. that needles may be magnetised by exposing them to the violet ray of the solar spectrum.

An equiangular prism of flint-glass being placed in an aperture of a window shutter, a sewing needle, about an inch long, which had been previously ascertained to be devoid of magnetism by its attracting indifferently either pole of a magnetized needle, was exposed to the violet ray of the spectrum, thrown on a pannel at the distance of five feet. One half of the needle was covered with paper as the authoress did not deem it likely that polarity would ensue, if the whole of the needle were uniformly exposed to its influence. In about two hours the needle became magnetised, the exposed end being found to be the north pole. The experiment having been many times repeated with the violet ray, and always with success, the blue and green rays of the spectrum were next ascertained to produce a similar effect, but in a less degree, and the indigo ray in a degree nearly as great as the violet. The yellow, orange, and red rays had no effect whatever on the needles exposed to them, even when the experimemts were continued for three successive days; nor was any magnetism developed by the calorific rays, which showed that heat had no share in causing the results.

Pieces of clock and watch springs appeared more susceptible of

magnetisation than the needles, probably on account of their greater extent of surface and blue colour. Bodkins were not affected, owing perhaps to their greater mass. When the violet ray was concentrated by means of the large lens employed by Dr. Woollaston, in his experiments in the chemical rays, magnetism was imparted to steel in a shorter time than by that ray in its ordinary state. It was found to be unnecessary to darken the room for these experiments, it being sufficient to throw the spectrum on a part of the room where the sun's rays did not shine.

From a number of other experiments (which we have not room to detail), it appeared, that when the solar rays were transmitted through blue and green glass, and through silk of the same colours, upon needles partly wrapped up as before, polarity ensued as in the former cases; but no effect is produced when the sun's rays are passed through a medium of red, orange, and yellow. From the whole of the experiments it may therefore be inferred, that the more refrangible rays of light have the property of imparting magnetism.

French Loco-motive Carriage.—A novel description of self-impelling carriage has been invented by M. Barret, of Lyons, which *(on dit)* is capable of performing a distance of 120 leagues in fifteen hours. It was lately exhibited at Lyons, by M. Barret, who went in it from his own house, in the Place des Celestins, to the Porte St. Clair. The carriage rests upon three wheels, one of which in front regulates the motion of the vehicle. A person sitting in the body of the carriage sets the two greater wheels in motion, by means of his feet, which he strikes alternately against a piece of mechanism formed in the interior. The carriage, by each stroke, passes over 16 feet of space, by which the whole distance travelled may be easily calculated.

[We give the above statement as we have received it, but we must question the possibility of a carriage being propelled at the rate of 24 miles an hour over the common road by the power of one man. There must be some error in the figures; or the Lyonese are striving to excel their far-famed Norman brethren in the art of fibbing.]

Compression of Air and Gaseous Bodies.—Some experiments have been made by M. Oersted, assisted by M. Suenssen in the compression of air, in which it appears that the law of Hooke and Boyle (not of Mariotte, as M. Oersted has it) holds good in the highest pressures they submitted it to. The most powerful compressions were made in the breach of an air gun, and they succeeded in compressing air to the 110th part of its volume. They also tried other gases, and found the like relation to obtain between the compression and the force producing it even when the gases were about to be converted into liquids. M. Oersted remarks, that in liquids the compressions also follow the proportion of the compressing force. Indeed, he might have referred to the fact as established by the experiments of our countryman, Canton; and it has also been established here, that the same law applies to solids. Hence the general conclusion of M. Oersted does not depend on a probable, but a well known, relation in the case of solids.

The simple law, then, that the diminution of volume is proportional to the compressing force, holds in each of the three classes of bodies, that is, in gases, liquids and solids.

Extremes of Temperature.—In no place on the earth's surface, nor at any season, will a thermometer, raised six or nine feet above the soil, and sheltered from all reverberation, attain 115 degrees of Fahrenheit. On the open sea the temperature of the air, whatever be the place or season, will never rise to 89 degrees. The greatest degree of cold ever observed on our globe with a thermometer suspended in the air is 58 degrees below Zero. The temperature of the water of the ocean in any latitude, or at any season, never exceeds 80 degrees.

Freezing Mixture.—The following method of obtaining ice at any season of the year, is said to be the recent invention of a chemist at Caen, in Normandy. Five pounds of pulverized sulphate of soda, and four pounds of sulphuric acid, at 36 degrees, are to be mixed in a small cask, which composition is stated to be capable of quickly freezing water.

Permanent Vegetable Green Pigment.—By a series of experiments made by S. Bizio, of Venice, upon the precipitated colouring matter of coffee, he finds that neither water, ether, alcohol, nor the alkaline sub-carbonates have any effect upon this green colour. Soda produces no change upon it, but caustic potash turns it to sky-blue; the acids generally affect it, but the sulphuric oxalic alone destroys the colour entirely; when it is dissolved in acetic acid the brilliancy of the green is much heightened.

Salads.—Washing salads for three or four minutes in sea or salt water, is recommended as an effectual means of getting rid of all insects. Vegetables of all kinds ought to be so cleaned, and afterwards washed in the usual way in fresh water.—*Literary Gazette.*

Gigantic Moth.—It is stated in a Madras journal, that a species of moth has been discovered near Arracan, of such extraordinary dimensions, as to measure ten inches from the tip of one wing to the tip of the other. The colours are also very beautiful.

Hazel Nuts found in a singular state.—A quantity of hazel nuts were lately dug up at Bonnington in a bog, at about 8 feet below the surface. The bottom of the bog consisted of a mixture of grey sand and brown moss, with some branches and stumps of trees quite rotten, among which the nuts were found. Upon opening these nuts it was found that the kernels had quite disappeared, leaving the membraneous covering quite perfect, without the least aperture, aad the nut itself as perfect as if the fruit had been fresh and ripe. The substance of the kernel must, therefore, have escaped through the membrane and shell in a gaseous state, or must have passed through them when decomposed and dissolved in water. In some of the nuts that had not arrived at maturity, the bag was very small, and was surrounded as in the fresh nut, with the soft fungous substance which had resisted decay.

WINDS.—According to a Journal kept by Mr. Stockton, of New Malton, we had in the last year 67 days of north winds, 36 of north-east, 14 east, 19 south-east, 49 south, 89 south-west, 40 west, 30 north-west, and 21 variable: brisk winds 42, and boisterous 22.

POISON OF THE COMMON TOAD.—The popular belief in the venemous nature of the Toad, Dr. Davy states, though of great antiquity, has been rejected as a vulgar prejudice by modern naturalists, decidedly so by Cuvier; but like many other long received and prevalent opinions, it is a true one, as the doctor has proved by experiment and analysis: the denial of it he considers to have resulted from superficial examination. The poison is distributed generally over the body.

CLARET.—The annual produce of the French vineyards in this wine only, is stated in a work, lately published at Bourdeaux, by M. W. Frank, to be no less than 250,000 tuns.

LIST OF NEW PATENTS.

CONDENSING APPARATUS.—To Robert Rigg, of Bowsted Hill, Cumberland, for a new condensing apparatus, to be employed in the preparation of vinegar. Dated Feb. 4, 1826. Six months.

EVAPORATING APPARATUS.—To Josias C. Gamble, of Dublin, for an apparatus for the concentration and chrystallization of aluminous and other saline solutions; also applicable to other purposes. Feb. 7. Four months.

HAT-MAKING.—To W. Mayhew, of Union-street, Southwark, and W. White, of Cheapside, for an improvement in the manufacture of hats. Feb. 7. Six months.

SHIP-BUILDING.—To Hugh Evans, of Holyhead, for a method of rendering ships more safe in cases of danger of leakage, bilging, &c. Feb. 7. Two months.

LOADING AND UNLOADING OF SHIPS.—To William Chapman, of Newcastle-upon-Tyne, for improved machinery for loading or unloading of ships, vessels, or craft. Feb. 7. Two months.

FILE-MAKING.—To Benjamin Cook, of Birmingham, for improvements in making files of various descriptions. Feb. 7. Six months.

TO OUR READERS AND CORRESPONDENTS.

A MECHANIC must excuse our giving insertion to his Communication, although it is descriptive of a real curiosity; it being our anxious desire to exclude every thing from our pages that is not of practical utility.

A description of the Engine mentioned by NAUTICUS, will appear in its place in the course of our History of the Steam Engine now in progress; that, as well as many others never before published, are already in the hands of the Engraver. Every engine of the present day, possessing a claim to both merit and originality, will also be described in due succession, so as to render it the completest history ever presented to the public.

A CONSTANT READER, on Hot-Pressing by Steam, in our next.

W. R.—GASOMETER, and TUBAL CAIN, are received.

Published by JOSEPH CAPES, Bookseller, 111, Fleet Street.

TO THE TRADE.—The publication of this work will be removed to Messrs. Cowie and Co. No. 60, Paternoster Row, commencing with the next number, (66). The Trade may, however, continue to procure the work through their accustomed channels, as the wholesale vendors will be the same.

Sold by GEORGE HEBERT, 88, Cheapside;—SHERWOOD, GILBERT, & PIPER, Paternoster Row; SIMPKIN & MARSHALL, Stationers' Hall Court; COWIE & STRANGE, 60, Paternoster Row; and may be had of all Booksellers in Town and Country.

PRINTED BY COE AND MOORE, 27, OLD CHANGE, ST. PAUL'S.

REGISTER

OF

THE ARTS AND SCIENCES.

No. 66.] SATURDAY, MARCH 25, 1826. [Price 4*d*

CONTENTS:

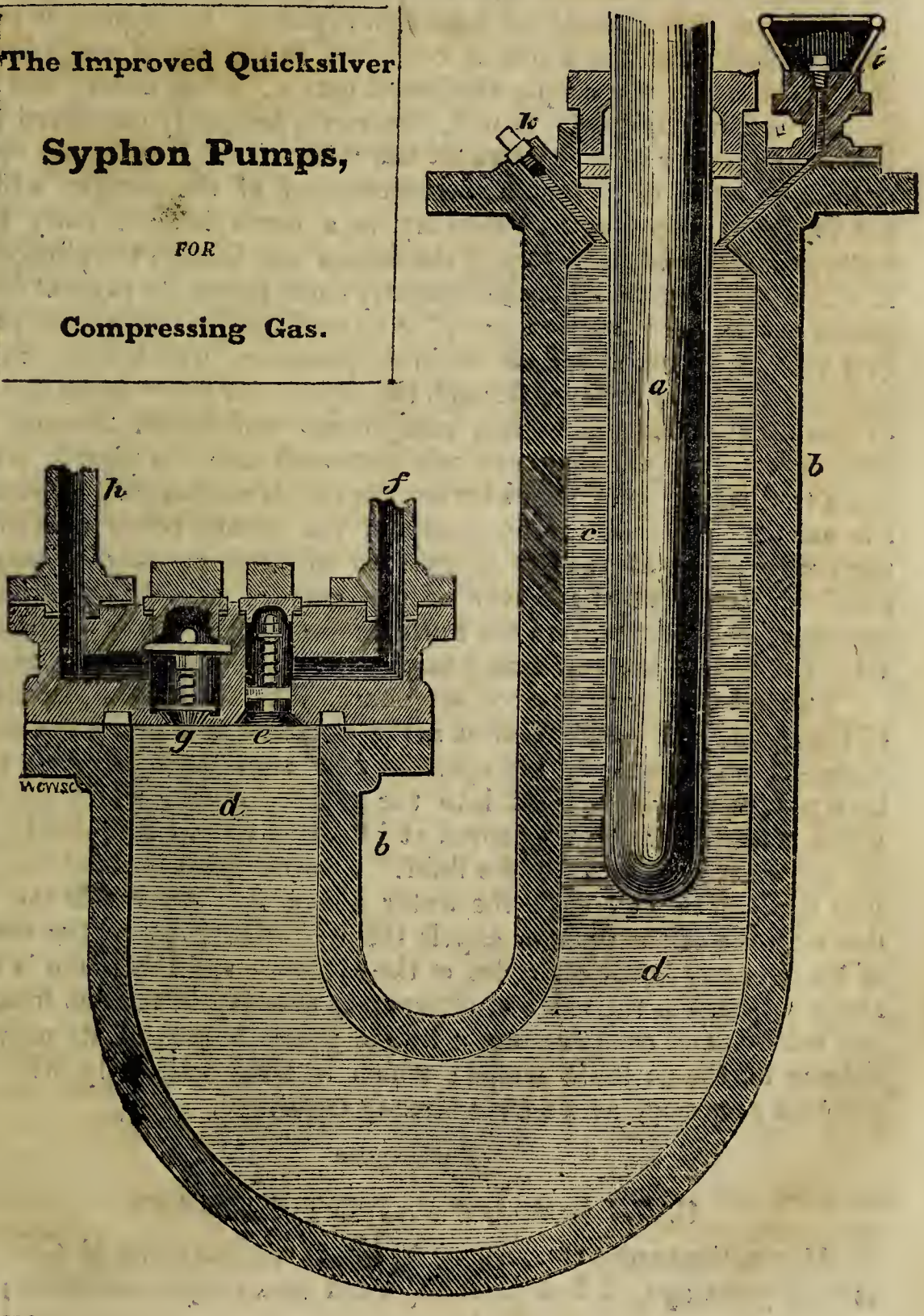
Gas Condensing Syphon Pumps 274
Gay-Lussac's Patent Candles ..... ib.
Expanding Wedge 276
Plane for hard or coarse-grained Wood .. 277
Sockl's Safety Valve for Steam Boilers .. 278
The Thames Tunnel 279
Economical Bread Oven 280
Anstey's Improved Melting Pots 281
Somerville's Safety Gun 283
History of the Steam Engine, Chap. II. .. 284
Composition of Twenty Quack Medicines 286
MISCELLANEOUS.—Ligneous Stucco, 287—New Mode of producing Stereotype, ib.,—Walrus, 288—Patents, &c. ib.

The Improved Quicksilver

Syphon Pumps,

FOR

Compressing Gas.



GAS CONDENSING SYPHON PUMPS.

In our account of the London Portable Gas Works, contained in our 59th Number, we stated that we should reserve a description of the internal construction of the condensing pumps and their mode of operation, for a future number; an opportunity having now occurred for fulfilling our promise, we gladly avail ourselves of it. The drawing from which the preceding engraving was taken, was kindly furnished us by Mr. Russel, the engineer, of St. John Street, who is at present employed in constructing an additional set of pumps at the works in Sutton Street.

The figure represents a vertical section of one of the pumps with the plunger *a* at its lowest immersion, or at the "down stroke" as it is called; at this moment of time every part of the syphon is completely filled with the fluids it contains, to the entire exclusion of atmospheric air; the deeply shadowed part *c*, being water, and the lighter tint, quicksilver. It will, therefore, be easily conceived that when the plunger is withdrawn by the "up stroke," an empty space or vacuum equal to the cubic admeasurement of the plunger will be left in the syphon; and as mercury is a much heavier body than water, the latter is pushed up by the former and follows the plunger as it ascends. The mercury consequently sinks below its present level, which causes the "suction valve" *e* immediately to open, and to let in a volume of gas under the ordinary pressure, which flows from a gasometer, or gas-holder, through the pipe *f*. At the "down stroke" of the plunger the gas is then compressed and forced through the discharge valve (which opens only outward) into the pipe *h*, which leads to a strong recipient wherein the gas is condensed, *(shewn at i in our 59th number.)* The action of the pumps being continued, the compression of the gas is effected to whatever degree may be required, provided the power of the engine, or other first mover employed is adequate. In the Portable Gas Works above mentioned, we believe there are now nine pumps at work with a 10-horse engine.

The quicksilver and water are poured into the syphon, by means of the basin, and perforation at *i*, the aperture at *k* being opened to allow the air to escape; the aperture *k* is next made perfectly tight by a plug which is screwed into the orifice, during which time the water is continually being poured at *i* to expel the air completely, and fill up every crevice with the fluid. Another plug is then screwed into the orifice at *i* with the water above it. After this the first down stroke of the plunger expels the atmospheric air on the surface of the mercury in the short leg of the syphon; and the pump is then ready to perform the office of alternately drawing in the gas from the gas holder, and compressing it into a thirtieth part of its previous volume in the portable lamps; which is done uniformly with the greatest accuracy, as we have already described.

GAY-LUSSAC'S PATENT CANDLES.

Until the nature of tallow or fat was investigated by M. Chevreul several years ago, it had been regarded as a simple substance; the

decisive experiments of that able chemist, however, clearly shewed, that it consisted of, at least, three distinct bodies; namely, a solid crystallizable substance resembling spermaceti, to which the name of *margarine* was given,*—an oily substance, which remains fluid at a temperature of 60° Faht. termed *elaine*, and the *sweet principle*.

The two former substances may be obtained, by dissolving the tallow in hot alcohol, when the *margarine* will separate by crystallization, and the *elaine* by evaporation of the spirit. A simpler process was adopted by M. Bracconot, which was, by squeezing the tallow between the folds of porous paper; the *elaine* was then absorbed by the paper, while the *margarine* remained solid. The paper being afterward subjected to pressure gave out its oily impregnation.

"When fat is treated with a hot ley of potash or soda," Dr. Ure observes, "the constituents react on one another, so as to generate the solid pearly matter, *margaric acid*, and the fluid matter, *oleic acid*, both of which enter into a species of saline combination with the alkali; while the third matter that is produced, the *sweet principle* remains free." As these substances exhibit the leading characters of acids, by reddening litmus paper, in decomposing the alkaline carbonates to unite to their bases, and in neutralizing the specific properties of the alkalies, they have been ranked as such by all succeeding chemical writers.

Mr. Gay Lussac (the French chemist) has taken advantage of the knowledge of these facts by taking out a patent for this country, (through the medium of Mr. Poole, of the Attorney General's Office) for the employment of the margaric acid, or solid crystallized fat, in the manufacture of candles; the patent likewise extending to a new mechanical construction of candles.

Of the several processes that may be employed for obtaining the margaric acid for this purpose, two are particularly described in the specification, namely, saponification and distillation.

The first is to be effected by incorporating any of the alkalies with the fat, as is done in the making of soap, and then decomposing the soapy fluid by an acid that has the greatest affinity to the peculiar alkali employed. It is recommended that the decomposition be effected in a large quantity of water, heated by steam, which should be kept well stirred. Being afterwards allowed to rest, the products will float on the surface in a condensed and solid form. If the tallow or fat, thus purified from the matters soluble in water, should still contain any of the salts employed in the previous process, it is to be washed by additions of fresh quantities of warm water, until they are perfectly discharged. This being done, and the mass of fat having become solid by cooling, it is to be subjected to the action of a powerful press, similar to those used for expressing the oil from seeds, when the fluid *oleic acid* will run off, leaving the margaric acid as a separate product in the press; of which the candles are to be made.

The distilling process is conducted by exposing the fat in an

* Called also *stearine*,—see Register of Arts, vol. iii. p. 7.

ordinary still, to the heat of a furnace. Steam is also to be introduced into the still, to facilitate the operation, and to carry over those products which are soluble in it, through the worm or condenser into a receiver. Care must be taken in regulating the heat of the furnace, to prevent a discolouring of the materials in the still. The fatty substances, thus prepared or purified, are to be taken out of the still, to be well washed, and then subjected to pressure as described in the saponifying process.

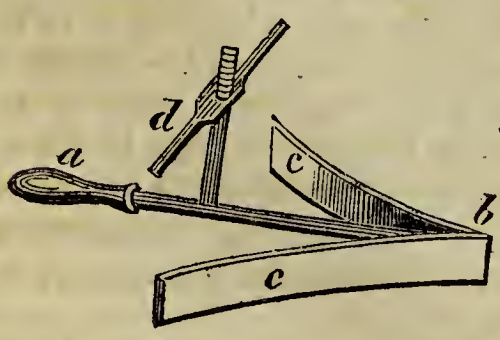
For the more perfect purification of the fat, both the foregoing operations of saponification and distillation, may be combined, and the residue afterwards subjected to pressure. The margaric acid may also be bleached by exposure to the air and sun, the same as in the bleaching of wax; the oleic acid or fluid oil may be whitened by similar means, and be applied generally to the same purposes as the vegetable oils, which it closely resembles.

Having now described the material from which the candles are to be made, we have to explain the construction of the candle itself, which is very peculiar: the wick is to be formed of cotton yarn, twisted rather harder than usual; it is to be twisted spirally round a metallic rod or thick wire, in the same manner as wire is sometimes coiled round the large strings of musical instruments: these wires or rods, covered with the cotton as described, are to be inserted into the moulds used for making candles, and when the candles are cast and have become hard, the wires are to be withdrawn, leaving the wicks behind in the candles, with a perforation equal to the size of the rods throughout their whole length.

A candle will thus become a hollow cylinder, through which a stream of air will be constantly passing with rapidity through the middle of the flame, so as to produce a perfect and vivid combustion of the tallow, with a light, we should suppose, by no means inferior in brilliancy to our best gas lamps.

EXPANDING WEDGE.

The Society of Arts has presented the "Silver Vulcan Medal" to Mr. T. Griffiths of the Royal Institution, for the invention of an expanding wedge, for the use of Sawyers, a representation of which we here annex.



a is the handle or centre piece, to which is connected two springs *c c*, joined together at *b*, the handle also carries a cross piece *d*.

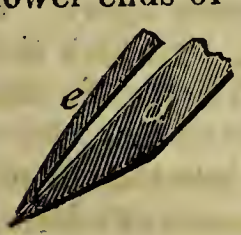
This instrument is intended chiefly to save the *time* and *trouble* of shifting the common wedges, while sawing up balks of fir into deals. When the saw has cut two or three feet, the loose ends of the springs *c c* are to be brought by hand, as near to the centre piece *a* as their elasticity will admit; the end *b* is then to be introduced into the cut, and the

wedge is to be thrust up to the end of the spring, the cross piece *d* resting on the upper surface of the balk. The elasticity of the springs will then be continually opening the cut as the saw proceeds to the length of about twelve feet; and the wedge, when at its utmost expansion, will be prevented by the cross piece from falling into the pit. It requires to be adjusted only once in twelve feet. Abridged from the Trans. Soc. of Arts.

The "trouble" of pushing in the common wedges used by Sawyers is very little indeed; the "time" occupied is but a few seconds, and at those periods, when the men rest a minute or two from the laborious operation of sawing. We much doubt whether Sawyers would use Mr. Griffiths's expanding wedge, if given to them; and we are quite sure, that they would not, out of regard to the invention, make a cut twelve feet long through a thick piece of timber without stopping. It is difficult to conceive what must be the feelings of a member of the *Royal Institution*, when he receives an honorary medal from a scientific body, for such a common blacksmith's job. We are bold to say, that any man of ordinary capacity, with a taste for practical mechanics, would invent one hundred things, quite as important and valuable, every day for a month together, were the subjects proposed to him.

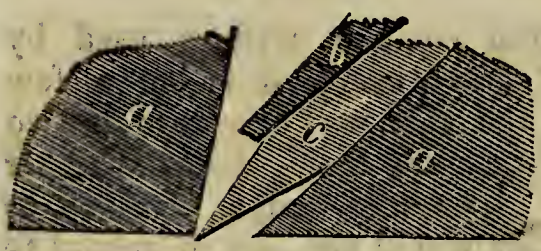
PLANE FOR HARD OR COARSE GRAINED WOOD.

The cutting edge of an ordinary plane-iron, has been hitherto uniformly produced by grinding, or otherwise forming, an *angle* or bevil upon only one side of it; the blade being then fixed in the stock of the plane, in such a position as to form an angle of about 45 degrees with the lower surface, its operation upon the wood is partly of a *cutting*, and partly of a *scraping* nature. In planing some kinds of wood, great inconvenience was found from this form by it frequently tearing up the surface, instead of smoothing it; a partial remedy for this defect was in consequence introduced about 24 years ago, by which another plane-iron, called a *top*-iron, was added to the under one, by means of a strong connecting screw, which caused the top iron, particularly at the edge, to press closely upon the lower one, as shewn by the annexed figure (which is an edge view of the lower ends of both), *d* being the lower iron, and *e* the upper. The



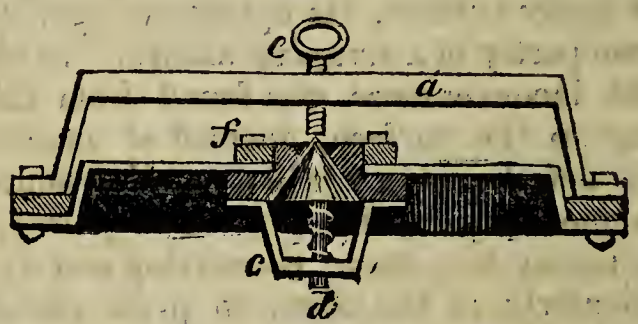
cutting edge of *d*, which projects a little beyond *e*, is therefore the same as before, but it is prevented from entering so deeply into the wood, or rather the shaving which has been abraded from the wood, receives a new direction by the abrupt interposition of the top iron *e*, and is thus prevented from causing a tearing-up with the grain, to the destruction of a level surface. The advantages of the "double plane iron" over the "single plane iron" being, therefore, unquestionable, the latter are consequently almost disused; the remedy is, nevertheless, incomplete, inasmuch as the lower iron presents the same angle as before; it cuts *better*, it is true,—but recourse to the scraper is still necessary.

The improvement now introduced is the invention of an ingenious workman named Williamson, of New Street, Eliza Place, Kennington Cross. It consists simply in employing the *single iron* as previously used, which is to be made of cast steel, of greater thickness than usual, and to be *bevilled on both sides*, as represented in the annexed section, of a portion of a plane. *a a*, is part of the body, *b* the wooden wedge, and *c* the plane-iron as fixed. By this form of edge, it will be perceived that it partakes more of the action of the *scraper*, and obviates more effectually the defects and objections to the former constructions. The edge is more strong and durable, it gives a beautifully smooth surface, almost without the aid of the scraper; and, in our opinion, entitles the inventor to a higher reward than that bestowed upon him for it, by the Society of Arts, (namely, ten guineas) as its useful application is so extensive. It is considered to be peculiarly valuable in plaining hard or coarse grained woods, and in cutting woods across the grain.



SOCKL'S SAFETY VALVE FOR STEAM BOILERS.

This valve is the contrivance of Mr. C. Sockl, of No. 17, Royal Row, Lambeth, who has been rewarded by the Society of Arts, with their large silver medal, and ten guineas, for the invention. It appears to be calculated to afford very great security, and, in the opinion of the inventor, is peculiarly applicable to steam boilers on board of vessels.



Instead of the solid lid which covers the main hole, a copper-plate or dish is to be substituted, as shewn in the above figure. *b* is the copper dish, surrounded by a ring of the same, by which the plate is firmly screwed down upon the rim of the main hole. In the middle of the plate is fixed the valve, of which *f* is the collar, made of iron or brass; *d* the plug, which is ground air-tight into the collar, and is kept in its place by the spiral spring which surrounds its stem, and the stay *e*: over the whole is fixed a strong cross piece *a*, which is firmly screwed down upon the ring that secures the plate *b*. In the cross piece works the regulating screw *e*, which may be screwed down upon the head of the plug.

The operation of the valve is easy to understand. *b*, the plate or dish, is only one-fourth or one-third the thickness of the other parts

of the boiler; it will not afford the same resistance to the steam: when this, therefore, gets beyond the ordinary pressure, it will cause the plate to become somewhat convex, and will thus leave a clear space between the collar *f*, and the conical plug *d*, for the steam to escape; as soon as the power diminishes, the place will, by its elasticity, return to its former place, and by closing down upon the plug, prevent any further escape of steam.

The object of this valve is not so much to regulate the working pressure of the steam, as to act in aid of the common valve, by affording an additional aperture in case the steam should acquire a dangerous degree of force. It differs from the plug valves in common use in this circumstance, namely, that in the latter, the plug rises out of its socket in order to allow a vent for the steam; whereas, in Mr. Sockl's, the socket rises away from the plug: the chief advantage resulting from this is, that if any adhesion should have taken place between the plug and the socket, it is more likely to be overcome on account of the great surface of the socket with its attached copper plate, which are exposed to the action of the steam. *Trans. Soc. Arts*, v. xliii.

The Thames Tunnel.—This extraordinary undertaking proceeds with as much rapidity as circumstances will admit. On the 2nd. of March, last year, the foundation of a circular brick tower, 50 feet in diameter, and 3 feet thick, was laid. This tower was gradually undermined, and sunk, until it rested on clay, 40 feet below the surface; a well was then built from beneath, to meet the kirb on which it stood, till, from the depth of 64 feet, the shaft was completed, and a wall formed, 17 feet deep, and 25 feet diameter, in the centre of the area, to serve as a receptacle for any water that might at any time casually collect in the works, and which always brings it under the command of the steam-engine pumps. The breaking through the shaft, and commencing the tunnel, were always looked forward to as among the greatest difficulties to be encountered. Such have, in fact, arisen, but, by skill and industry, they have been surmounted as they rose; the tunnel has been safely carried through, and closely and effectually united with the wall of the shaft; the arches, and foot and carriage-ways have been commenced, and the iron machine invented by Mr. Brunel, to give security and confidence to the men in excavating, is already advanced nearly 40 feet from its first position in the shaft.

One universal Meridian.—"It is very desirable," Mr. De La Place observes, "that all the nations of Europe, instead of referring their calculations of longitude to the meridian of their principal observatory, should have some common meridian, which nature seems to have pointed out for that purpose. That agreement would introduce into the geography of the world the same uniformity that exists in its almanacks and in its arithmetic? an uniformity which extending to the numerous objects of their mutual relations, forms various countries into an immense family."

M. De La Place proposes either the Peak of Teneriffe, or Mont Blanc, as the point through which this common meridian should pass.

ECONOMICAL BREAD OVEN.

To the Editor.

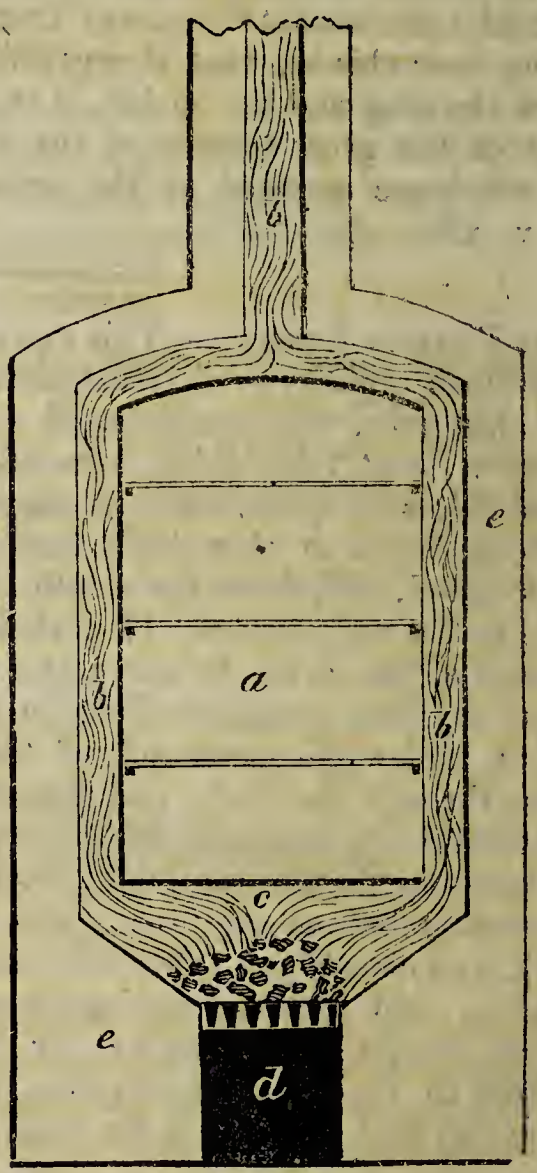
Sir,

I have herewith sent you a description of an oven, which would, I think, be found economical and convenient for public inns and private families, who bake their own bread.

I am, Sir,

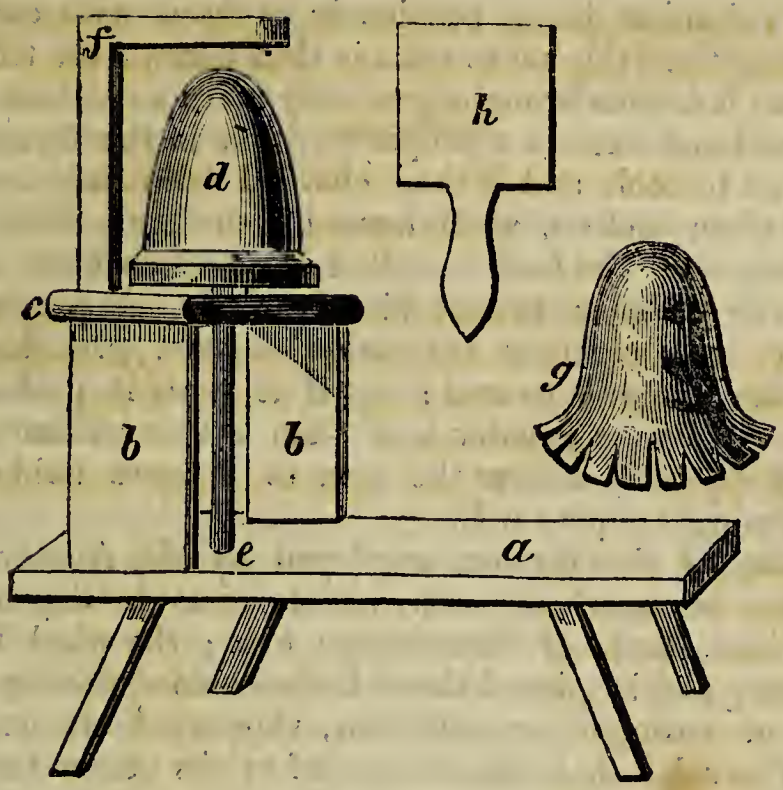
March 6, 1826. Your constant reader, and well-wisher,

J. C.



*Description.** — The annexed figure gives a sectional view, the front of the oven being supposed to be removed to shew the interior construction. *a* is the oven; *b b* the flue, which passes over the exterior surfaces of the sides, the back, and bottom of the oven; *c* is the furnace; *d* the ash pit; *e* the brick-work enclosing the oven. It is not intended that anything should be placed on the bottom of the oven. The shelves are not formed of iron plates, but consist, each, of two oblong or parellelogram trivets of wrought iron, placed side by side, a little distance apart from each other. The oven is supported at the back by horizontal bars fixed in the brick-work at each corner. The front of the oven has three seperate doors and frames; one large one for the oven part, and two smaller underneath for the furnace and the ash-pit.

* The description sent to us by our correspondent has reference to *four* very excellent shadowed drawings of the subject, (two sections, an elevation, and a plan) but as they are not strictly necessary to a full understanding of so simple a contrivance, we have given but one of them in outline, and altered the description as applicable to that alone. The room that the whole four would have occupied in our very limited space, and the unnecessary expense of the engravings, will, we trust, be considered by our correspondent as affording a sufficient apology for their non-introduction.]—Ed.



ANSTEY'S IMPROVED MELTING POTS.

The value and importance of melting pots, for the fusion of metals, that will remain unaltered after exposure to the intense heat of an air furnace, every brass or iron founder must be fully sensible of. The composition employed in the manufacture by Mr. Anstey, (of Somer's Town) consists of two parts of Stourbridge clay, and one part of the hardest coke well ground and tempered together, A full description of his process is given in the 43rd vol. of the Transactions of the Society of Arts, just published, from which we make the following extracts.

Take two parts of fine ground raw Stourbridge clay, and one part of the hardest gas coke, previously pulverized and sifted through a sieve of one eighth of an inch mesh. Mix the ingredients together with the proper quantity of water, and tread the mass well, (if the coke is ground fine, the pots are very apt to crack). The pot is moulded by hand on a wooden block as shewn in the above figure, in which *a* is the bench ; *b b* two uprights, supporting a cross board *c*, and ends in a pin that turns in a hole in the bench ; *f* is a guage to regulate the thickness of the melting pot, as shewn by the dotted lines ; *g* is a cap of linen, or cotton placed wet on the core before the clay is put on ; its use is to prevent the pot from sticking partially to the core while it is taking off ; the cap adheres to the pot only while wet, and may be removed without trouble or hazard (to the pot) when dry : *h* is a wooden bat, to assist in moulding the pot ; when moulded they are carefully dried at a gentle heat.

The smaller pots hold about twenty pounds of cast iron, and can be afforded for ten pence a piece ; the larger ones hold forty pounds, and may be afforded for fourteen pence.

A pot dried as above, when wanted for use, is first warmed by the fire side, and is then laid in the furnace with the mouth down-

wards (the red cokes being previously covered with cold ones, in order to damp the fire), more coke is then thrown in, till the pot is covered, and it is then brought gradually up to a red heat. The pot is then turned and fixed in a proper position in the furnace without being allowed to cool, and is then charged with cold iron, so that the metal, when melted, shall have its surface a little below the mouth of the pot. The iron is melted in about an hour and a half, and no flux or addition of any kind is used. A pot will last for fourteen or even eighteen successive fusions, provided it is not allowed in the intervals to cool; but if it cools it probably cracks. These pots will bear a greater heat than others without softening, and will consequently deliver the iron in a more fluid state, than the best Birmingham pots will.

The cavity of the furnace employed by Mr. Anstey, is eleven inches square in superficial area, and consists in depth of eleven rows of bricks, made of Stourbridge clay; the wind hole is four inches square, and is placed three inches below the top; the bars are either of wrought or cast iron, supported on wrought iron bearers. The ash hole is ten courses of bricks below the bars, and the chimney is rather a high one. The sides of the furnace wear away by the heat, so that in the first week, the cavity becomes two inches wider than at first. It is then brought up to its original width, by a lining of glass-cutters' mud, which consists of fine sand, mixed with particles of glass, and this is renewed twice a week. The cavity of the furnace being only eleven inches across, and seven inches of that being occupied by the melting pot, it is, of course, necessary that the coke used as fuel should be broken into small pieces not larger than walnuts.

At a subsequent meeting of the committee, D. Campbell, Esq. who had been requested to make some experiments on Mr. Anstey's pots, reported that he had melted a charge of iron in one of the smaller pots, placed in a powerful wind furnace; the pot remained sound.

Into a second pot was put a Wedgewood crucible, inclosing a black lead one, and that a Cornish one; a cover was luted on, and the pot thus charged was kept for three hours in the same wind furnace, and was brought unopened to the committee. On examination, Anstey's pot appeared to be quite entire; its shape had not altered, nor was there any change of texture, indicating an approach to fusion: it resisted several blows of a hammer before it broke. Of the crucibles inclosed in the pot, Wedgewood's had cracked to pieces, and the texture had become compact and semi-vitreous; the black lead one had softened considerably, and had undergone a change of shape; the Cornish one was unaltered in shape, and nearly so in texture, having only become somewhat more compact.

A third pot had been exposed for an hour to a very high heat in the same furnace, being placed on a brick of Stourbridge clay; several small crucibles had been put into it, and a cover had been luted on. On examination, the pot had undergone no change, except that the slag of the coke, which was used as fuel, had glazed it over: beneath

the glaze, there were no signs of fusion, nor even any change of texture. The brick support was in the state of porcelain jasper; the cover had begun to sink in; the Cornish crucible which was enclosed shewed a beginning of fusion; the Chelsea crucible was bubbly and half melted.

An empty five-inch real Hessian crucible had been heated in the same furnace as strongly as possible; it had not sunk down at all; on being broken, the texture appeared porcellanous with interspersed air bubbles, shewing a beginning of fusion.

A white Birmingham pot was first annealed, and then heated empty in the same furnace. On examination by the committee, it was found to be cracked across the bottom, and its texture had become that of porous porcelain jasper.

Another white Birmingham pot was treated in the same manner as the former, and on examination, presented several small cracks, and a porcellanous texture, but less porous than the preceding.

One of Anstey's large pots, in which five charges of iron had been melted, was shown to the committee; the form was unaltered; it withstood several blows with a hammer before it broke, the texture was granular, without any commencement of porcellanous.

Mr. Somerville's Safety Gun.—A priest is said to have invented gunpowder, and to a clergyman, of the church of Scotland, we are indebted for an improvement on guns, which is admirably calculated not to destroy, but to preserve, human life from accidents by fire-arms. We allude to the invention of the Rev. Mr. Somerville, of Currie. Mr. Somerville's new gun is completely locked at all times, and in every possible circumstance, except when brought to the shoulder and levelled at an object, which, at the very moment, and in the very position, it should be unlocked; it is locked even in its progress to the shoulder, and in its descent from it; for the spring which keeps the lock immoveable is never touched till the gun is brought up to the shoulder, and levelled by the eye, and then the left hand, by a gentle pressure on the safety spring, unlocks the trigger, and thus allows the gun to be fired in the ordinary way. But, besides safety, this gun evidently possesses several subordinate advantages: greater despatch is evidently one of these, as the sportsman, with this gun, is enabled, with the most perfect security, to go always with his fowling-piece full cocked, and thus, without loss of time, or distraction of thought, is always fully prepared for discharging it. Besides, it places the left hand in the place of safety, in case of the gun bursting, and renders fire-arms, brought into houses, lying in rooms, and exposed to the curiosity of young, ignorant, or thoughtless persons, perfectly safe.—*Literary Chronicle.*

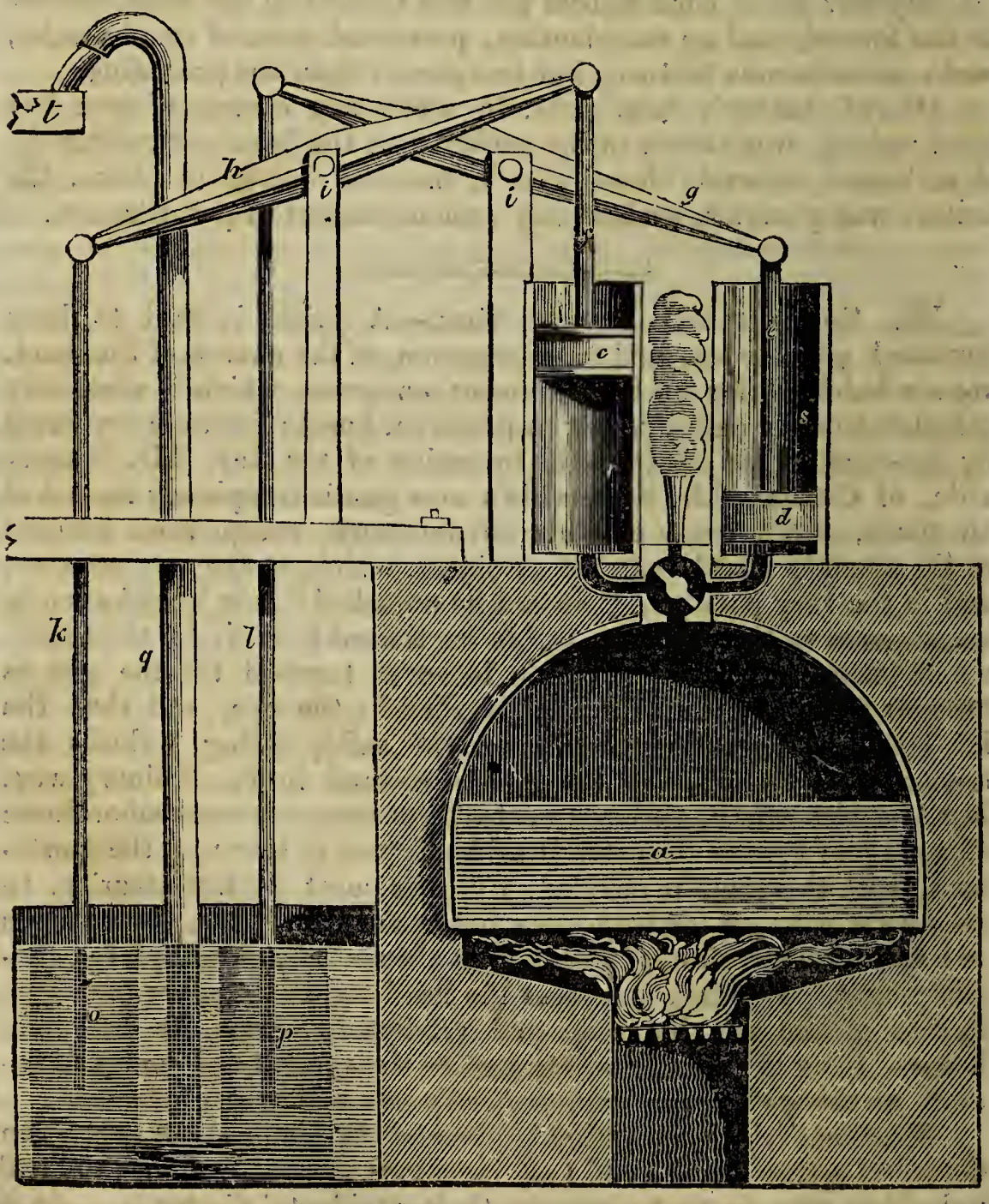
Mr. Somerville's invention is patented by him; the specification describes *several* secure and very ingenious methods of locking and unlocking guns so as to prevent their accidental discharge. As it would be difficult to describe them intelligibly without the aid of diagrams, we must dismiss the subject, for the present, with these remarks.

History of the Steam Engine.

CHAPTER II.

Contents.—LEUPOLD'S HIGH-PRESSURE ENGINE—ADVANTAGES OF HIGH-PRESSURE ENGINES.

In the year 1720 the celebrated Leupold constructed *the first high-pressure engine.* Previous to this the only use to which steam had been effectively applied was in the formation of a vacuum: true it is, that in the projects of De Caus, Branca, and Savery, the elastic force of steam was proposed to be used; but the failure of these plans by waste of steam and other causes, warrant our belief that the plan of Leupold entitled him to the great merit of having *invented and constructed the first high-pressure engine.* His principle was simply that of applying highly elastic steam alternately upon two pistons in separate cylindars, so that as one ascended the other descended, and vice versa.



In the above figure (nearly resembling that given by Leupold) the boiler *a*, communicates by a "*four way cock*," *x*, with the bottom of two *open topped* cylinders having pistons *c d* moving in them. These pistons are fitted with

lead so that they may act as a counterpoise to the pump buckets *o p*. They are likewise attached to the beams *g h*, by means of the rods *e f*. To the other ends of the beams are fixed the pump rods *k l*, which work two force pumps, *o p*. *q* is a perpendicular pipe, bended round at the top so as to convey the water driven up the pipe into the cistern or spout *t*. *i i* are the centres of the two beams *g h*. *x* is a cock so constructed as to alternately admit the steam into either cylinder.

In the situation of the machine shewn in the figure, the steam in the boiler flows through the open passage into the cylinder *r*, and presses the piston *c* upwards: this depresses the pump rod *k*, and forces the water under the plunger, up the pipe *q*. When the steam has raised the piston *c* to nearly the top of the cylinder, the cock *x* is turned one fourth of a revolution, so that it opens a passage between the cylinder *s*, and the boiler; and between the cylinder *r* and the open air. The weight of the rod *f*, and the lead in the piston *c*, being greater than *k* and *o*, the piston descends by its gravity to the bottom of the cylinder, driving out the steam which raised it into the atmosphere. From the construction of the "*four way cock*" at the moment in which the passage into the cylinder *r* was closed, another passage was opened between the boiler and cylinder *s*; the elasticity of the steam forces the piston *d* upwards, and depresses the plunger at the end of the rod *l*, and impels the water, in the barrel *p* under it, up the pipe *q*. When the piston *d* has reached the top of the cylinder, or made its stroke, the further passage of steam from the boiler is shut off, by turning the cock *x*; and the steam escapes into the atmosphere through *z*; and *d* descends in the cylinder by its preponderance in the same manner as *c*. During the ascent of *d*, *c* has fallen to the bottom of the cylinder *r*. The steam passage from the boiler being then opened, *c* is again raised in its cylinder, while the vapour in *s* is escaping into the atmosphere; thus producing an alternate vertical motion in the pump rods *k l*.

Such was the construction of the first high-pressure engine, which for simplicity has never been exceeded. The extended use of such engines at the present day, proves that the public opinion is materially changed in regard to their utility and safety. The risk of explosion was a drawback upon them, which successive improvements and skilful management has almost annihilated; and we have no doubt but that, eventually, the low pressure or condensing engine will be entirely abandoned in favour of those. Their superior economy by reduced consumption of fuel, and reduced friction, are sufficient grounds for their general adoption. We should observe, however, that there is still a mass of prejudice to contend with, ere this can possibly take place, and whilst America has scarcely a low pressure engine to work a steam boat, it would be a hazardous speculation to attempt the introduction of a high-pressure one in England for that purpose.

But from the importance which the latter does, and will maintain, in the mechanical world, it will not be amiss to shew the advantages which they possess: and we shall first speak of that obtained by a saving of fuel.

Water does not boil under a temperature of 212° of Fahrenheit, at which temperature its force, when confined, is barely equal to that of the atmosphere. But let the temperature be increased only 38° more, (which can be effected with a comparatively small addition of fuel) and its force will be 28lbs on the square inch. In like manner let the temperature be increased to 280°, and the force will be equal to 56lbs. Thus, the increased force far exceeds the increased consumption of fuel, and, consequently, the greater the pressure of the steam the greater will be the saving. Recent experiments have proved that steam, when heated to 1170°, will act with a force of 56,000lbs on the square inch, so that we find 250° gives a force of only 28lbs, whilst rather more than four times that temperature, or 1170°, gives 2000 times the force; a fact sufficiently establishing the superior economy of high-pressure steam.

It should be observed, however, that we by no means believe that great pressure can be used with safety; but we merely state the fact to establish the position that high-pressure are more economical than low pressure engines.

The saving of power, by reduced friction, is also another material advantage in the former, because it is evident that a force of 50lbs. be obtained instead of about 19 in the condensing plan, the area of the piston will be

smaller in the same proportion as the force is increased, in order to produce a given effect, therefore, the edges of the piston being reduced also, there will be less rubbing surface than in the other.

[*To be continued.*]

THE COMPOSITION OF TWENTY QUACK MEDICINES.

[We have received the following communication from a correspondent, and while we confess that the subject of it does not fall within our province, we are tempted to give it insertion, from a desire to see exposed the tricks and impositions of quacks. Some of the medicines are not considered to be unsuited to the complaints which they are proposed te remedy; others, on the contrary, are highly pernicious; and we think it right that the public should be put upon their guard with respect to the composition of the whole of them. It appears to us, also, to be deserving of consideration, that supposing some of the medicines to be good, what security is there for their regular preparation; when they are, for the most part, extensively made up by petty, needy dealers in drugs, who have, frequently, no knowledge of the genuineness, or goodness, of the materials, are perfectly ignorant of their chemical constituents and affinities, as well as of their medicinal properties. Ed.]

To the Editor.

Sir,

I have selected from Dr. Paris's Pharmacologia, the formulæ for the preparation of a score of quack medicine, and I think you would render a service to the public by inserting them in you popular work.

Charter House Square,
16th March, 1826.

Your constant reader,
C——S F——Y.

Anderson's Pills. Aloes, jalap, oil of aniseed.

Aromatic Lozenges of Steel. Sulphate of iron, and tincture of cantharides!

Pectoral Balsam of Honey. Tincture of benzoin!

Bate's Anodyne Balsam. One part tincture of opium, two parts of opodeldoc.

Brodum's Nervous Cordial. The tinctures of gentian, columba, cardamom, and bark, with the compound spirit of lavender, and the wine of iron.

Ching's Worm Lozenges. Chiefly calomel and jalap.

Daffy's Elixir. Compound tincture of senna, sweetened with treacle, and flavoured with aniseed and elecampane root.

Dalby's Carminative. Magnesia 40 grains; oil of peppermint, 1 drop; of nutmeg, 2 drops; of aniseed, 3 drops; tincture of castor, 30 drops; of assafœtida, 15 drops; of opium, 5 drops; spirit of pennyroyal, 15 drops; compound tincture of cardamoms, 30 drops: peppermint water, 2 ounces.

Essence of Coltsfoot. Equal parts of the balsam of tolu, and the compound tincture of benzoin, to which is added double the quantity of spirits of wine: this is proposed as a *pectoral for coughs!* upon which Dr. Paris says, that "if a patient with a pulmonary affection should recover during the use of such a remedy, I should certainly designate it as a lucky escape, rather than a skilful cure."

Whitehead's Essence of Mustard. Oil of turpentine, camphor, and spirit of rosemary, with a little flour of mustard to colour it!

Freeman's Bathing Spirits. Opodeldoc, coloured with Daffy's elixir.

Godbold's Vegetable Balsam. Honey and vinegar!

Gowland's Lotion. A solution of corrosive sublimate, in emulsion of bitter almonds.

James's Analeptic Pills. Jame's powder, gum ammoniacum, pill of aloes, with myrrh, of each equal parts, made into a mass with tincture of castor.

Norris's Drops. A coloured solution of tartarized antimony in rectified spirit.

Roche's Embrocation for the Hooping Cough. Olive oil mixed with half its quantity of the oil of cloves, and amber.

Ruspini's Tincture for the Teeth. Florentine iris root, 8 ounces; cloves, 1 ounce; rectified spirit, 2 pints; ambergris, 1 scruple.

Solomon's Balm of Gilead. An aromatic tincture, of which cardamoms form the leading ingredient made with brandy.

Steers's Opodeldoc. Castile soap, 1 ounce; rectified spirit, 8 ounces; camphor, 3½ ounces; oil of rosemary, half a drachm; oil of origanum, one drachm; solution of ammonia, 6 drachms.

Taylor's Remedy for Deafness. Garlic infused in oil of almonds, and coloured *by alkanet root.*

Lignreous Stucco—is a composition of the dust of wood, with glue for cementing the particles together: when in the state of a soft paste it is cast in moulds, and afterwards dried, by which solid ornaments of various kinds are produced, in imitation of carved work. The process is as follows:

To obtain the dust, shavings of the wood proposed to be used may be highly dried in an oven, and then reduced to powder in a mortar. For coarse work, common sawdust may be employed, it being only necessary that the particles of wood should be small, so as to make a tolerably smooth paste when mixed up with the glue. The glue is to be used in the state of clear strong size; it should therefore be carefully prepared, by dissolving it in a proper proportion of water, and allow it to cool, to ascertain its consistency. The sawdust employed should be sifted into two portions, by sifting one through a fine sieve, and the other through a coarser. A part of the size should then be heated to a fluid state, and the finest of the wood-dust mixed with it, so as to form a smooth paste: the moulds made of common plaster or of sulphur are then to be prepared for casting, by oiling their interior surfaces with a brush, the mixture or paste may then be spread over to about the thickness of a quarter of an inch, and while this is drying, the coarser portion of wood-dust may be mixed with some more size, as before mentioned, with which the moulds may now be completely filled, to give the moulded figure strength and solidity, taking care to clear off with a knife the superabundant part of the paste before it hardens. When the casts have shrunk within the moulds, they may be taken and thoroughly dried. If employed as ornaments to furniture, they may be securely stuck on with glue, and afterwards be varnished or coloured, the same as upon the wood. By using woods of different kinds, very elegant ornaments may be made, of the same colour and appearance as the natural wood to which they may be attached, and at a much less cost than carving.

New mode of producing Stereotype.—M. Senefelder, of Munich, the inventor of lithography, has just conceived a new kind of

stereotype, the principles of which are described as follows:—He covers a sheet of common printing paper with a coat of stony earth, a twenty-fourth part of an inch in thickness, which has imbibed a sufficient quanty of water. At the end of half an hour, it having taken the consistence of a paste, he lays it on the types and characters, composed in the usual way, but not inked, and an impression is produced in the paste. The sheet is then dried, and melted metal being poured over it, the characters are all found in relief on a thin plate of metal, and as exactly formed as the original types. Proofs from these stereotyped characters differ in no respect from proofs from moveable characters.

M. Senefelder offers to disclose the details of this invention to 30 subscribers, of 100 florins each. The expense of the necessary apparatus for the casting he estimates at 100 florins, and that of the paper coated with the stony paste, at 6 kreutzers the sheet.

A Walrus, or sea-horse, was lately seen in the Portland Frith, and in several parts of the Orkney Islands; it was at length taken on the rocks of the isle of Ely. The animal was very lean, but of an immense size, its skin measuring 15 feet by 13, and an inch thick: it is said to be the first of these formidable animals that have been met with on our coasts.

LIST OF NEW PATENTS.

PERUVIAN BARK.—To W. Warren, of Crown Street, Finsbury, for improvements in the process of extracting from the Peruvian Bark, medicinal substances known by the name of *quinine* and *cinchonine*, and preparing the various salts to which these substances may serve as a basis. Feb. 11. Six months.

RIGGING.—To J. L. Higgins, of Oxford Street, for improvements in the masts, yards, sails, rigging, &c. of ships, &c. Feb. 11. Six months.

STRAW-PLAT.—To Thos. Walter, of Luton, Bedfordshire, for improvements in the manufacture of straw plat for bonnets, hats, &c. Feb. 18. Six months.

HOUSE FASTENINGS.—To B. Newmarch, of Cheltenham, and C. Bonner, of Gloucester, for a mechanical invention for suspending and securing windows, gates, doors, shutters, blinds, &c. Feb. 18. Six months.

ADMINISTERING MEDICINES BY STEAM.—To C. Whitlaw, of Bayswater Terrace, Paddington, medical botanist, for improvements in administering medicines by the agency of steam. Feb. 18. Six months.

HATS.—To Arnold Buffum, of Bridge Street, London, for improvements in the manufacture and dying of hats. Feb. 18. Six months.

TO OUR READERS AND CORRESPONDENTS.

The note of A Civil Engineer of 20 Years' Practice we do not clearly comprehend in all its parts; possibly it may be convenient to him to call at No. 60, Paternoster Row, where it might be explained verbally. At all events, we shall be happy to receive his communications.

The subject of J. R.'s favour has been already published in most of the periodicals.

We have to acknowledge the receipt of W. W., H. Tree, H. L., and Pro Bono Publico, all of which are intended for insertion.

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REGISTER

OF

THE ARTS AND SCIENCES.

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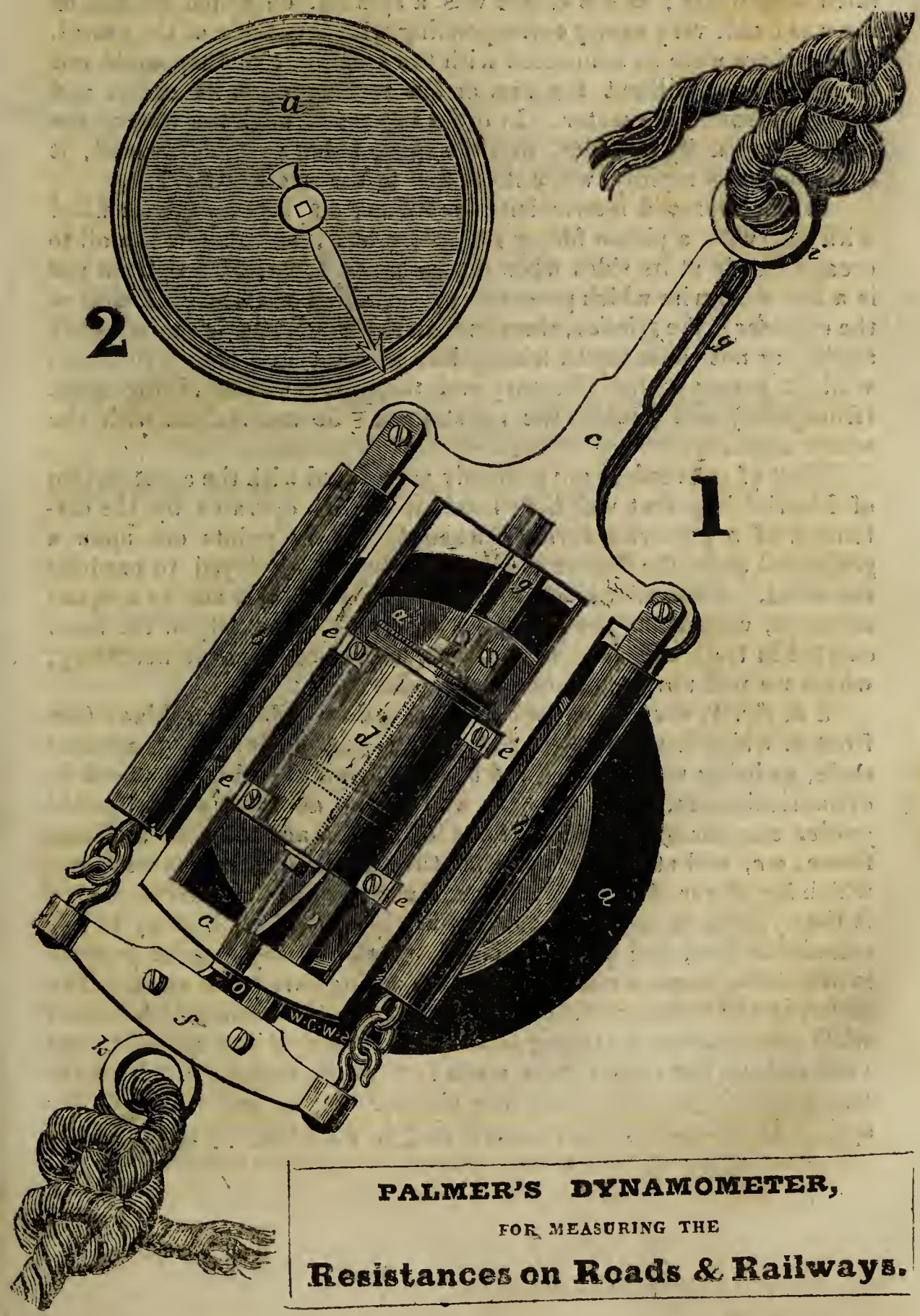
CONTENTS:

Palmer's Improved Dynamometer 290
Novel Construction of Steam Boats 291
Preparation of Isinglass 292
Improved Mode of Barrowing out Earth.. 293
Dodd's Fire Extinguishing Machinery.... 294
Cow's Improved Ship's Launch..... 296
Indian Process in Making Gun-Barrels and Sword-Blades 298
Machine for Measuring and Weighing Ships and Cargoes 299
London Mechanic's Institution, Mr. Wallis's Lecture on Astronomy 300

Artificial Anatomy, 303—Improvements in the Metropolis, ib.—Fish Bird of China, ib.—Labour, 304—Patents, Correspondents, &c. 304



PALMER'S DYNAMOMETER,

FOR MEASURING THE

Resistances on Roads & Railways.

PALMER'S IMPROVED DYNAMOMETER.

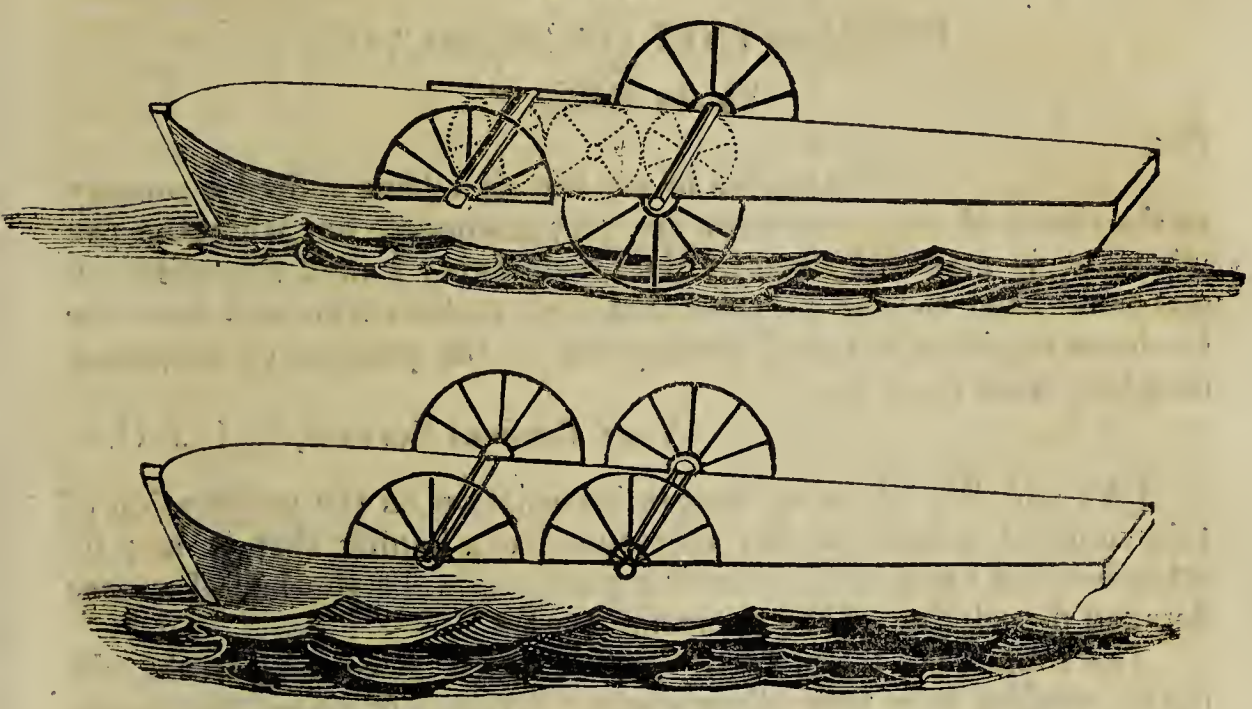
This instrument was constructed by Mr. H. R. Palmer, some two or three years ago, for measuring accurately the degrees of resistance upon roads and railways, and is an improvement upon a former invention of his for the same purpose. In the dynamometers previously constructed, the resistance was determined simply by the distension of strong springs; the vibrations of which, owing to the inequality of the surface, and consequently of the power applied, gave very uncertain indications. To overcome this difficulty Mr. Palmer first attached to a spring dynamometer, a semicircular vessel filled with water; at the centre was a spindle, on which an arm or fan was fixed, very nearly corresponding with the inside of the vessel. The springs were so connected with the spindle, that they could not be acted upon without the arm or fan turning upon its centre and passing through the water. In order to pass through the water, the latter escaped by its sides, and the space being extremely small, it could not pass rapidly, while it yielded to the smallest force.

In the improved instrument Mr. Palmer employs a cylinder filled with oil, with a piston fitting so loosely in it, as to allow the oil to escape slowly at its sides when drawn up or down. The piston rod is a fine steel wire which passes through stuffing boxes at both ends of the cylinder; the *friction*, therefore, in this apparatus is so extremely slight, as not to be worth taking into account in any experiments; while it prevents that vibratory and trembling motion of the index (from jerks) and enables the resistance to be ascertained with the nicest accuracy.

Most of our readers are probably acquainted with the construction of Marriott's patent weighing machine, which operates by the distension of a powerful spring; when the index points out upon a graduated scale the degree of force or weight employed to produce the effect. That instrument alone, therefore, would act as a dynamometer, were it not, as above stated, for the inequality of the force exerted in traction; certain additions, therefore, become necessary, which we will now endeavour to describe.

a a, fig. 1, shews the back of Marriott's weighing machine, (the front of which is given in separate *fig.* 2, (but without the graduated scale, as being unnecessary); *b b* are two spiral springs enclosed in cylindrical cases, (similar to the well known domestic article, called *pocket steelyards)* the upper ends of which are fixed to a sliding frame, *c c*, and at their lower ends they are hooked to a cross bar *f*, which bar *f* is made fast to a piece of metal, *o*, at the back of *a a; d* is the cylinder of oil, which is *fixed* firmly at the back of *a a*; to this cylinder is fixed four pieces of metal, *e e e e*, having angular grooves in which the frame *c c* slides when the springs are acted upon. The piston in the cylinder is shewn by dots, the rod to which (a fine steel wire) passes through stuffing boxes at each end of the cylinder, and each end of the rod is then made fast to the frame *c c*. Now the bar *g* which proceeds from the circular box *a*, and acts upon the spring, is connected, at the swivel ring *i*, with the upper end of the

frame *c c, as one solid piece;* therefore, when the ring *k* is made fast to a carriage, and power applied to the rope at *i*, the bar *g* is drawn out of *a*, while the frame *c c* acts simultaneously upon the steelyard springs *c c*, which moves along with them the piston in the *fixed* cylinder, *d*; the oil therein being incompressible, is compelled to pass from one side of the piston to the other, through the extremely narrow interstice between the periphery and the cylinder.



NOVEL CONSTRUCTION OF STEAM BOATS.

To the Editor.

Sir,

Being a sailor, and taking an interest in Steam Navigation, I peruse with avidity any thing in your valuable work relative to that art. In your 51st Number you gave a description of a plan of Mr. Gordon's for making the paddles act at right angles with the surface of the water; this is, undoubtedly, a discovery devoutly to be wished for; but if I understand properly Mr. Gordon's proposition, he intends to carry the paddle case below the surface of the water, and, if this is the case, I appeal to any body conversant with ships if the additional resistance he thus creates will not much more than counterbalance any thing gained by the direction in which the paddles strike against the water.

I once saw a plan, imagined by a master of a merchant vessel, whose name I do not know, for taking the wheels out of the water when sailing without steam; the plan appeared to me at the time feasible. On each side of the vessel he had two half wheels which revolved in such a way, that when one was in the water the other was out, thus performing the service of a whole wheel; but when it should be required to take them both out of the water they would be both turned with their semi-circles up, and their diameters parallel to the surface of the water, thus leaving nothing in the water. Such a

vessel would, consequently, be as capable of sailing without steam as any sailing vessel; which, for ocean navigation, would be a great advantage.

The following is the sketch of what I have described, at which you are at liberty to laugh if you think proper, as I have no pretensions to be a draughtsman.*

Your obedient Servant,

19*th March*, 1826. A SAILOR.

PREPARATION OF ISINGLASS.

To the Editor.

SIR,

IN the course of my travels I have visited a country in the rivers of which sturgeon are very abundant, but where no use whatever is made of them by the inhabitants; I shall therefore feel much indebted to any of your numerous readers who will have the kindness to give a detailed description of the process of preparing isinglass from these fish.

Your obedient Servant, I. J. C.

[We add the following meagre information on the preparation of this valuable article for our correspondent, hoping that it may by attention and experiment serve his purpose, in the absence of a more detailed description of the operation.]—ED.

The sounds are taken from the fish whilst sweet and fresh, slit open, washed from their slimy *sordes*, divested of a very thin membrane which envelopes the sound, and then exposed to stiffen a little in the air. In this state, they are formed into rolls about the thickness of a finger, and in length according to the intended size of the staple: a thin membrane is generally selected for the centre of the roll, round which the rest are folded alternately, and about half an inch of each extremity of the roll is turned inwards. Isinglass is best made in the summer, as frost gives it a disagreeable colour, deprives it of weight, and impairs its gelatinous principles.

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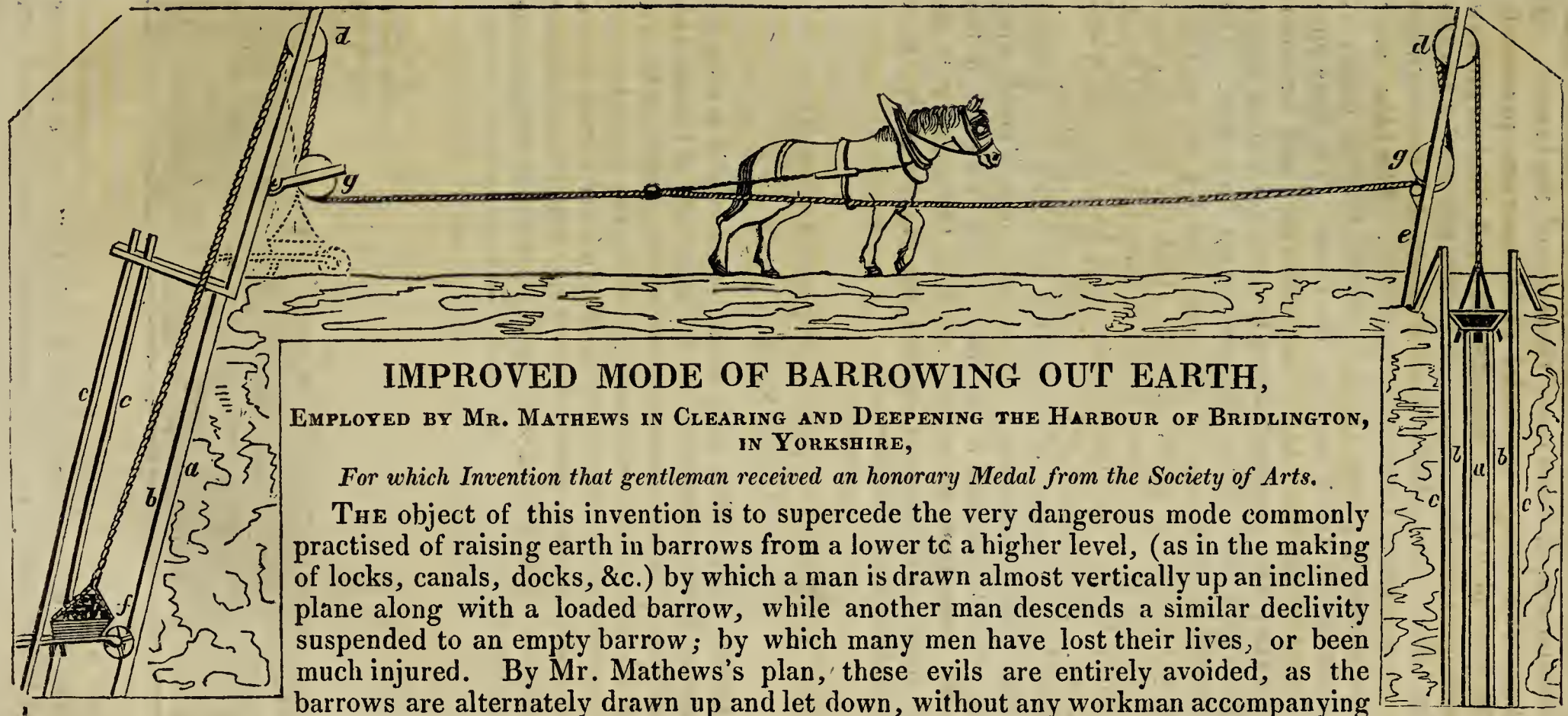
* [These drawings consisted of two side elevations of a steam boat, in outline, which, although perfectly intelligible to the majority of readers, might not be so to all; we have, therefore, thrown the two figures a little into perspective, by which, we presume, the conception of the projector is more clearly exhibited.—To cause the half wheels to revolve regularly in the manner mentioned, is, of course, of easy accomplishment in a variety of ways, which we take leave to mention, although evident to every *mechanic*. If a drum-wheel was fixed on each of the paddle wheel shafts, an endless band or chain embracing them both would give them rotation in a like direction. Or, instead of this method, a cog wheel might be fixed on each of the shafts, so as to admit of a third cog wheel, whose teeth should take into those of the former, which would produce the desired movement; this method we have intended to shew in the first diagram, by three small wheels in dots. To admit of each half wheel to be turned upwards out of the water when it is intended the vessel shall use her sails alone, any of the well-known apparatus termed disengaging and re-engaging machinery, it appears to us, may be employed without any difficulty.]—ED.



IMPROVED MODE OF BARROWING OUT EARTH,

EMPLOYED BY MR. MATHEWS IN CLEARING AND DEEPENING THE HARBOUR OF BRIDLINGTON, IN YORKSHIRE,

For which Invention that gentleman received an honorary Medal from the Society of Arts.

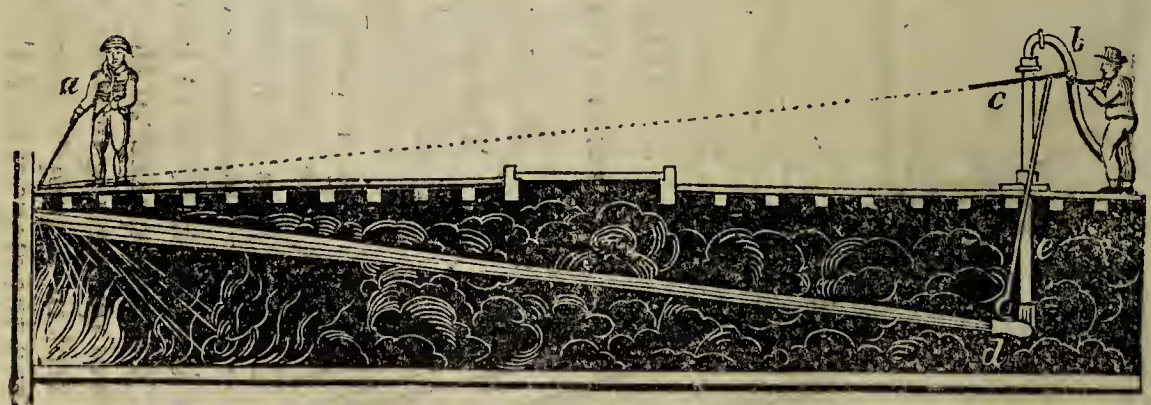
THE object of this invention is to supercede the very dangerous mode commonly practised of raising earth in barrows from a lower to a higher level, (as in the making of locks, canals, docks, &c.) by which a man is drawn almost vertically up an inclined plane along with a loaded barrow, while another man descends a similar declivity suspended to an empty barrow; by which many men have lost their lives, or been much injured. By Mr. Mathews's plan, these evils are entirely avoided, as the barrows are alternately drawn up and let down, without any workman accompanying them. *a a* is a plank 10 or 11 inches wide, laid at a small angle sufficient to keep the barrow wheel in contact with it; and two strips, *b b*, are spiked to the edge of the plank so as to form a trough or groove for the wheel of the barrow to run in. Two pieces of quartering or small spars, *c c*, are fixed on each side at a proper distance to guide the handles, by which the barrow is kept in a proper position against the plank upon which the wheel runs. About 10 or 15 feet above the top of the plank and the stage where the loaded barrow is to land, a pulley *d*, is fixed to a pole *e e*, through which the rope or chain

is passed down to the barrow; to the end of a rope is fastened a hook, which goes into an eye, *f*, fixed upon the front of the barrow. A pair of slings are slid upon the handles of the barrow, previously fastened to the rope at a proper distance, to keep the barrow in a right position to be drawn up the plane or plank, which is, when the handles of the barrow are a little below a horizontal line with the wheel of the barrow while running up the plank. The rope, after passing over the pulley *d*, passes through another vertical pulley *g*, at a proper height to suit the draught of the horse. The same operation is performed by the horse traversing backwards and forwards as in the usual plan; viz. a loaded barrow is taken up and an empty one let down, except their being unaccompanied by a man. The pulley *d* is elevated so high as to let the rope from the barrow clear the bank, and yet incline so much inwards, that the barrow clears the bank as it swings in, and lands itself as shewn by dotted lines. The man has only to fix the ropes to the empty barrow, and wheel the full one away. *Abbreviated from the Trans. Soc. of Arts.*

[As Mr. Matthews's manner of barrowing out earth is a decided improvement upon the dangerous and too common mode of conducting that operation, we have thought it our duty to give it a place in the Register; at the same time we cannot admit it to be a new "invention," but simply an improved application of the pulley to a particular purpose.]—Ed.

DODD'S PATENT FIRE EXTINGUISHING MACHINERY.

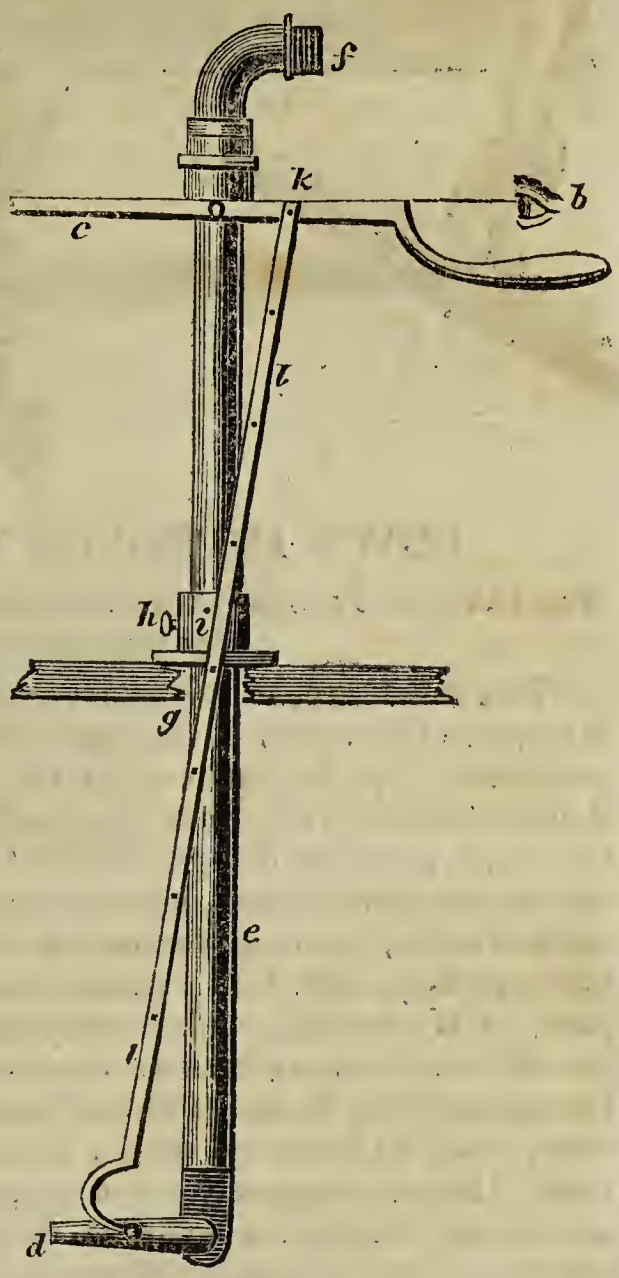
This apparently very clever and useful apparatus is a recently patented invention by Mr. George Dodd, the engineer, of Queen Ann Street, Westminster. It consists in a peculiar arrangement of levers, and joints to the hose of fire engines, by which the operator may direct a jet of water to any unseen part of the interior of a ship or a house on fire; such part being excluded from his view, by intervening floors or partitions. This will at once be understood by reference to the annexed figure;—



where a person is seen at *a* pointing with his cane to the spot where the fire is situated; the operator *b* then directs the lever *c* he holds so as to point to the same part; this movement causes the nose *d* of

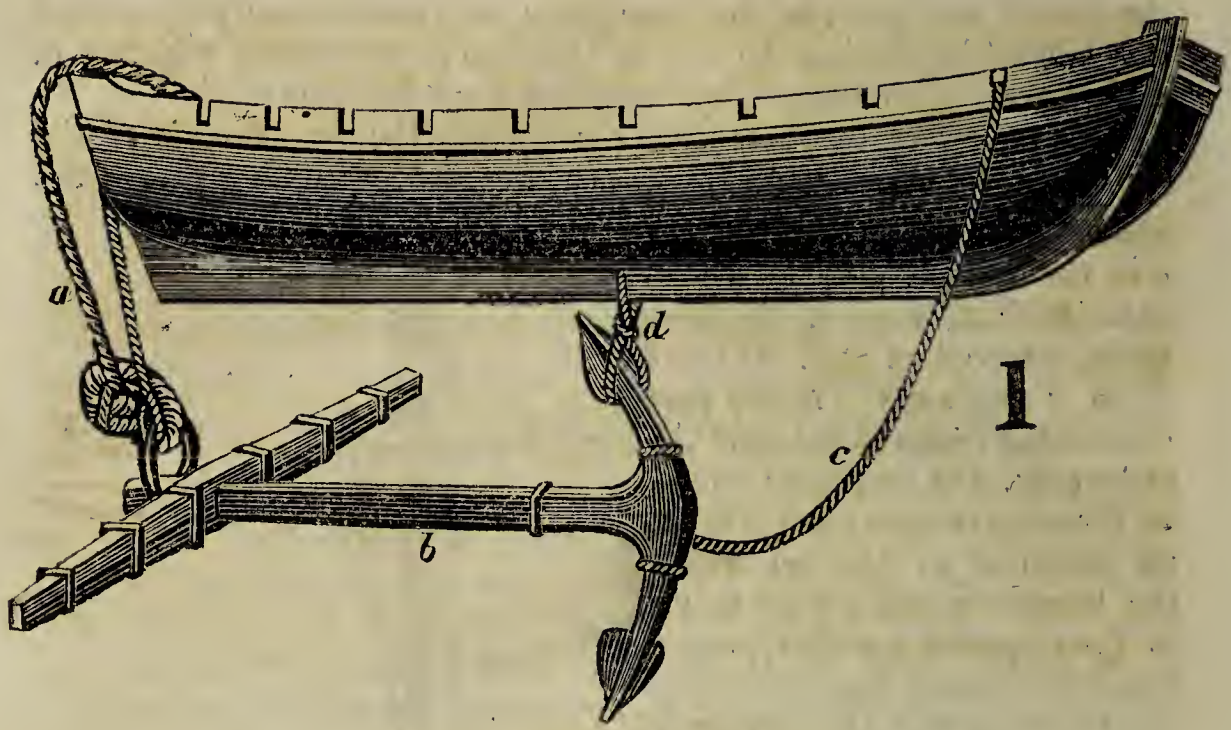
the branch *e* to point to the same place, and consequently the utmost effect in extinguishing the fire in the ship is produced; which is of course greatly accelerated by excluding the admission of air.

We have now to shew more particularly the construction of the apparatus, by which these effects are produced, by adding part of the above figure on a larger scale; *e* is the branch pipe of a fire-extinguishing engine, the hose being screwed on at *f*. If there is no "bull's eye" in the part of the deck required to insert the apparatus, the carpenter would be directed to strike out a hole, as shewn at *g*, through which the branch would be let down to the required position, when it would be made fast by turning the screw *h* into the ferrule *i*, the aperture below being entirely covered by a large flanch at the bottom of the ferrule, as represented. The lever *c* moves upon a fulcrum, or centre pin, at the upper end of the branch pipe; not to the pipe itself, but to another ferrule fixed there: to this lever is attached, by another centre-pin, *k*, the long bar *l l*, which is connected by a pivot joint to the nose piece *d*. It will now be seen, that if the distance between the two joints in the nose piece is the same as the distance between the two joints in the lever *c*, a corresponding motion will be produced when



operated upon, in any required direction; upward, downward, horizontally and obliquely; and as the long rod *l* is perforated with a number of holes, it may be attached in any part of its length to the lever *c*, so that the jet may play close under the deck or far from it. It is also obvious that the branch pipe may be likewise raised or lowered as may be desired.

In the drawings attached to the specification several modifications of the apparatus are exhibited, and the manner of operating under different circumstances; the selection which we have made, however, explains every thing that appears to be necessary.



COW'S IMPROVED SHIPS' LAUNCH,

FOR LAYING OUT AND WEIGHING HEAVY ANCHORS, AND FOR LANDING AND EMBARKING CANNON.

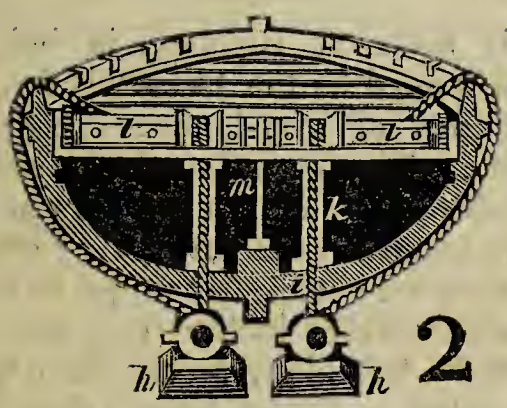
THE usual mode of laying out anchors by means of a ship's launch, is to place the anchor in the boat's stern, and to coil the cable on the gunwhale; but this lumbers up the boat, overloads it, and exposes it to the imminent hazard of being swamped in a high sea. To obviate this very pressing danger, attempts have been made to sling the anchor beneath the boat, as near as possible in the centre of gravity; none of these, however, succeeded so as to encourage their adoption. Subsequently, Mr. Cow, (master boat-builder of the Royal Dock-yard, at Woolwich), took the matter in hand, and by very simple but effectual arrangements, obtained results so satisfactory as to induce the Navy Board to direct that every ship of war of a particular class, shall be furnished with a launch fitted upon Mr. Cow's principle. It has also received the approbation of the Ordnance Board, who have ordered its adoption for the landing and embarking of cannon. For the purpose of laying out and weighing of anchors it is of course equally applicable to merchant ships. A very detailed description of the invention, with the mode of operating in a variety of cases, as respects both the anchor and the cannon, is given in the last volume of the Transactions of the Society of Arts (just published), being a communication from Mr. Cow to the Society, who have rewarded the inventor with their Gold Vulcan Medal.

The former method (alluded to above) for carrying an anchor under a boat's bottom was to have only one *fixed* trunk, which was in the middle of the boat, close to the side of the keel; the windlass therefore could only be supported at the ends, and was unequal to the heaving up of any great weight; the great strain, also, was entirely on the sides of the boat. By Mr. Cow's plan there are two *moveable* trunks at a proper distance from the keel, thereby enabling

a strong stanchion to be placed on the keelson, which stanchion supports the middle of the windlass, and consequently makes it of sufficient strength to weigh any weight that the boat is able to sustain.

The application of the invention for the purpose of landing and embarking heavy guns is also of great importance, as it enables this operation to be conducted on a beach, with perfect safety to the men and boats at times when the surf is so great as to preclude the possibility of boats approaching near enough to land, or to embark them in the usual way.

It is proposed to carry two guns under the bottom of the boat, one on each side of the keel, to bring the boat to an anchor without the surf, at a prudent distance from the shore, (which distance, local circumstances must determine) so as to prevent the boat striking on the gun; a small line is the only communication necessary with the shore, by which line the larger hauling ropes are conveyed; the guns are lowered from the boat, and hauled up the beach.



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Should the operation be carried on where there is a rise and fall of tide, and the guns should not be immediately wanted, it will be only necessary to take the boat in at high water and drop the guns, *which may be taken up as the tide leaves it*; in either case the boat is instantly fit for any other service, without risk of damage by being kept afloat. The interior of the boat is left clear, for stowing the carriages and other stores.

The embarking the guns is done in the same way, care being taken to have anchors of sufficient power to moor the boat without the surf, so as to counteract the weight of the gun, and the resistance it meets with in being hauled off from the shore.

Reference to the Engravings.—Fig. 1 gives a perspective view of a 74-gun ship's launch, with a bower anchor suspended under the bottom, and a bower cable coiled into the boat. *a* is the cable, *b b* the anchor, *c c* a buoy rope, *d d* rope by which the anchor is hove up when weighing, or suspended when carrying, by the windlass. *Fig.* 2 gives a midship section of the launch, with two 32 pounder iron guns suspended from the windlass; *h h* the guns lashed to wood slides, *i i i* ropes by which the guns are hove up to the boat's bottom; *k k* water-tight removable wood trunks, through which the ropes pass to the windlass; *l l* the windlass in two parts, connected by a wrought iron gudgeon and socket; *m* a removable strong wrought-iron stanchion, which supports the middle of the windlass.

INDIAN METHOD OF TWISTING IRON FOR GUN BARRELS AND SWORD BLADES.

(From the Transactions of the Society of Arts.)

7, High Row, Knightsbridge,
March 7th, 1826.

DEAR SIR,—Having obtained through the medium of my brother, Capt. Michael Edward Bagnold, of Bombay, the process used in manufacturing gun-barrels and sword-blades at Damascus, with the peculiar method of tempering weapons used by the natives of India, I shall be happy to communicate the same to the public through the medium of the Society, if thought worthy of their notice.

I possess several barrels, made in my brother's presence, by a Damascus workman, which, with specimens of the work in different stages, I shall be happy to lay before the Committee.

To Arthur Aikin, Esq. I am Sir, &c.
Secretary, &c. T. M. BAGNOLD.

The gun-barrels made at Bombay, in imitation of those of Damascus, so much valued by the Orientals for the beauty of their twist, are manufactured of iron-hoops, obtained from European casks, mostly British. The more these hoops are corroded by rust, they are proportionably acceptable to the workman; should there be any deficiency of the necessary oxidation, they are regularly exposed to moisture, until they are sufficiently prepared for welding. Being cut into lengths of about twelve inches, they are formed into a pile an inch or an inch and a half high, laying the edges straight, so as not to overlap each other; a longer piece is then fitted so as to return over each end, and hold the whole together in the fire. This pile is then heated, and drawn out to a bar of about one inch wide, and one third of an inch thick; it is doubled up in three or more lengths, and again drawn out as before; and this operation is repeated generally to the third or fourth time, according to the degree of fineness required. The bar is then to be heated about one third of its length at a time, and being struck on the edge, is flattened out the contrary way to that of the stratification. This part of the operation brings the wire or vein outwards upon the strap. The barrel is then forged in the usual way, but much more "jumping" is used than in the English method, in order to render the twist finer. The most careful workman always makes a practice of covering the part exposed to the fire with a lute, composed of mud, clay, and the dung of cows or horses, in order to guard against any unnecessary oxidation of the metal. When the barrel is complete, the twist is raised by laying the barrel from one to five days either in vinegar, or in a solution of the sulphate of iron, until the twist is raised; this process is called the wire twist. To produce the curl, the bars or straps are drawn out to bars about three quarters of an inch square, and twisted, some to the right and others to the left; one of each sort are then welded together, doubled up, and drawn out as before; and upon the experience of the workman, any intricacy of twist is produced by this drawing out, doubling and twisting.

Sometimes, to save trouble and economise iron thus prepared, the artist will rough file an English barrel, weld a strap of Damascus iron spirally round it, or several are laid longitudinally and welded on. A native artist never works with coal under any consideration; charcoal from light woods forms his only fuel.

In making the sword blades there are several methods used; some make a pile of alternate layers of soft and hardened steel, with powdered cast-iron, mixed with borax, sprinkled between each layer. These are drawn out to one third more than the length of the intended blade, doubled up, heated, twisted, and re-forged several times; the twist is brought up in the same way as that in gun-barrels.

Some swords are forged out of two *broad* plates of steel thus prepared, with a narrow plate of good iron welded between them, leaving a solid steel for the edge of considerable depth. Others prefer to make them of one plate of steel, with a lamina of iron on each side of it, to give strength and toughness.

Swords of this description were tempered in my brother's presence, in the following compound; and (as he states) with considerable effect. The blade was covered with a paste formed of equal parts of barilla, powdered egg shells, borax, salt, and crude soda, heated to a moderate red heat; and, just as the red is changing to a black heat, it is quenched in spring water.

From the information obtained from this workman, it appears, that Damascus obtains all its steel from the upper part of the Deccan, where it is called the *fonlode hind*, or Indian steel, of which there are great quantities, but little or no demand for it; the damasque (or *joar*) is natural to this steel, and is raised by immersing it in an acid solution.

MACHINE FOR WEIGHING AND MEASURING SHIPS AND CARGOES.

(From a Correspondent.)

M. Reitmayer, of Mayence, has constructed a machine to ascertain the amount of cargo that a vessel is able to contain, as well as to determine its exact weight. It resembles in its principles the platforms used on land for weighing waggons, &c. It is built in the water, at a place where the depth is always uniform. The ships are brought to it when empty, when by means of scales at the side of the machine, the measure of the vessel is accurately shewn, as well as its weight in the water. The scale is calculated upon hydraulic principles according to the buoyant power of the water from diameter to diameter, and according to the figure of the ship and its cubic contents, nothing more is required, than to place the vessel when loaded in the machine, which will immediately shew the weight of the vessel and cargo, from which the weight of the vessel when unloaded, is to be deducted.

London Mechanics' Institution,

WEDNESDAY, 5th of APRIL, 1826.

MR. WALLIS'S FIRST LECTURE ON ASTRONOMY.

FORM OF THE EARTH—ITS MOTIONS—CENTRIFUGAL FORCE—SEASONS—DAY AND NIGHT.

Mr. Wallis commenced his lecture by observing that the members were accustomed, in the lectures delivered in this place, to have the different subjects demonstrated by experiments; but the science which he was about to lay before them did not admit of experimental demonstration, though it would afford them as much satisfaction in the experimental illustrations with which he should accompany his observations.

Astronomy, said the Lecturer, is that branch of physical science which describes the motions, distances, and magnitudes of the heavenly bodies.

Our acquaintance with astronomy is derived from comparing, by analogy, the laws which are known to exist among the different substances on the surface of the earth, and the motions and changes which are observed to take place among the more distant bodies. Hence Astronomy is merely hypothetical, and consequently requires a greater exercise of the imagination than any other branch of natural philosophy. Analogy, we well know, has long been exploded from all the physical sciences, since they are proved by facts within the reach of our senses; while the facts of Astronomy, being far beyond their reach, can only be deduced by analogical reasoning.

The Lecturer then adverted to the fact of falling bodies tending towards the centre of the earth being well known in all ages; and observed that Sir Isaac Newton, by a superior mode of reasoning, inferred that this force would be sufficient to occasion the moon to fall towards the earth.

He observed that the phenomena connected with the *earth* would form the object of his present lecture: he alluded to the similarity of figure existing among all the planets belonging to the system, and, from analogy, he was led to believe that the form of the earth was similar to the form of the others.

Proofs of the globular form of the earth may ultimately be drawn from its diurnal motion; for, either the earth must turn on its axis once in 24 hours, or the whole universe must be supposed to revolve round the earth in that time: for all the heavenly bodies appear to rise east of the meridian of any place, and to set west of it. On the surface of the earth motion is only relative, being the space described by one body, compared with that, described by another body in the same time.

Mr. Wallis here alluded to the fact that the heavenly bodies all appear to move round the axis of the earth, and not merely round its centre; for if they only turned round the earth's centre, some of them might be observed proceeding from north to south, or from south to north, instead of all appearing to proceed, in parallel circles, from east to west.

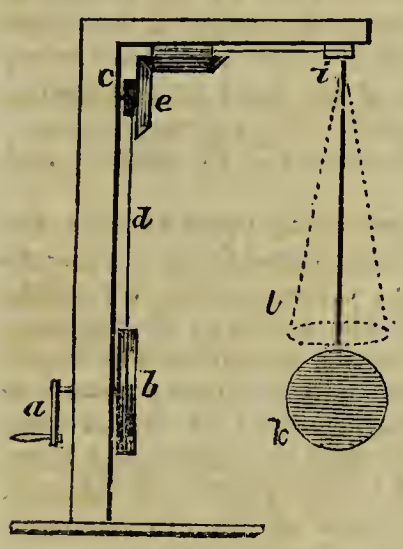
The motions of Venus, Mars, Jupiter, and Saturn, on their respective axes, discoverable from spots on their surfaces, were here instanced, and the diurnal motions of the others, though not ascertained, were inferred from these. It is but fair to infer, then, that the earth also revolves on its axis, instead of all the other bodies revolving about it, as a common centre; and if the earth possesses this motion, and is of a globular form, different parts on its surface, will move with different degrees of velocity. At the equator, the motion will be about 1000 miles per hour; while at London, the motion is only about 500 per hour, and at the poles the motion ceases altogether.

Two elastic hoops, crossing each other at right angles, were then put in rapid motion on an axis, to show that the centrifugal force caused their poles to approach each other, and the parts farthest from the axis to recede farther from each other.

The earth is composed of innumerable elastic particles: two balls of lead, though possessing very little elasticity, struck forcibly together, will rebound, showing that they are elastic. As a considerable portion of the earth consists of granite, which is known to be much more elastic than lead, from its transmitting sound more readily, the earth may therefore be considered to possess a considerable degree of elasticity throughout: hence, the centrifugal force caused by the earth's diurnal motion, will give it the form of an oblate spheroid. Now the polar diameter of the earth is found by actual measurement to be 36 miles less than the equatorial, a confirmation, that the parts of the earth partaking of the greatest motion, are most affected by that motion.

The Lecturer here introduced several experiments, to prove, which they did very conclusively, that bodies, if at liberty to adjust themselves while in motion, would rotate *only on their shortest* axes; obeying an universal law of nature.

For this purpose the ingenious apparatus in the annexed diagram was employed, to give a rapid motion to bodies suspended by their equatorial or longer axes. *a* is a winch, on the spindle of which is the wheel *b*; the motion of *b* actuates the little wheel *c*, by means of the cord or endless band *d*; the spindle of *c* also carries the bevilled wheel *e*, which being in contact with another bevilled wheel *f*,* actuates that, as well the drum wheel *g* connected to it; another endless band is then passed round *g* and the little wheel *i*, which causes the latter to revolve with great velocity. To this little wheel *i*, the Lecturer suspended a very oblate spheroid (almost flat, like the convex lens of a telescope) as shewn at *k*; on turning the handle *a*, gently, its disposition to quit its vertical position was manifested; on quickening the motion, its axis became first inclined, and gradually acquired the horizontal position, as shewn by the dotted lines at *b*, and continued thus to revolve while the machine was kept in action.



The oblate spheroid *k* being removed, Mr. Wallis next suspended a metal chain at *l*, the lower end of which was turned up, and connected so as to form a loop, as shewn in the annexed diagram at *o*. A rapid rotation being now given to the chain, by the apparatus above described, caused the loop of the chain to open, while it was gradually yet quickly attaining the horizontal position, shewn at *q*; and to prove that the loop had expanded itself into a circle, and was revolving upon its shorter axis, the Lecturer placed a lighted lamp *inside of it*. The planet Saturn, (the ring of which revolves on its axis at the rate of 90,000 feet in a second of time), was then adduced as an instance in nature of this peculiar motion of bodies. A large model of this extraordinary planet was suspended to the machine, by the edge of its broad ring; rotary motion being communicated to it, it gradually turned upon its shortest axis, and the planet was seen to revolve as in nature, with its beautiful ring in an horizontal position, or rather at right angles with its axis. This brilliant and interesting illustration was received by the audience with the most marked delight. From these and other experiments, it may be inferred, that the earth revolves on its axis, giving to the heavenly bodies the appearance of revolving round the earth.

Besides the diurnal motion of the earth, the sun appears to change its place among the stars; for if we observe a star to pass any fixed point at a given time (as at ten o'clock at night, when the sun has passed the meridian

* These wheels have no teeth or cogs, but their peripheries are covered with woollen cloth, which affords sufficient friction or resistance, while a very rapid motion is produced in perfect silence.

ten hours), we shall find a week afterwards, at the same hour, that the star will be westward of its former point; and if we continue our observations upon the same star, we shall find the distance between it and the sun to be continually lessening, until the sun passes by it, and the star is seen on the opposite or western side. Hence the sun appears to proceed from west to east among the stars, and would complete its revolution in 365 days. But this motion of the heavenly bodies is only an apparent motion, which is accounted for by the earth moving round the sun from west to east. The Lecturer demonstrated the impossibility of this apparent motion of the sun being real, and stated that, it was contrary to all known mechanical principles to make a heavier body revolve round a lighter one, by several ingenious and decisive experiments with balls of different magnitudes upon a whirling table.

An excellent illustration of the effects of centrifugal force was shewn by two glass tubes, each containing a portion of small shot, water, and air, which were placed in an inclined position, with their lowest ends on the centre of motion of a whirling table. While at rest, the substances named in the tubes of course occupied stations according to their specific gravities; the lead being at the bottom, the water in the middle, and the air at the top; but on giving the tubes a rotary motion, the centrifugal force produced a reverse arrangement of the substances, the air being at bottom, the water in the middle, and the lead at top.

As the different parts of all spherical bodies revolving upon an axis are subjected to different velocities, the effects of the centrifugal force will be as various on different parts of the earth's surface; consequently we might expect that a pound of lead would be heavier at the poles than at the equator, this, however, would not be easily discovered, as the weight which would balance the lead at the poles, if carried to the equator, would lose as much of its own weight as the lead did: but we have an easy method of discovering this difference by the pendulum, which is merely a weight suspended to a fixed point, and which occillates by its own gravity, and as this gravity is different in different parts of the earth, there will be a differenee of time in the oscillations of pendulums of the same length, which is found to be the case.

Gravity is the tendency particles have to approach and come in contact with each other; it is this power that holds the particles together, which compose the earth; and as the earth consists of an infinite number of these particles, the greatest attraction or gravity must be in the direction of the greatest number of these particles, which is in the direction of the diameter or a right line, passing to the earth's centre; hence all bodies on its surface are attracted towards its centre. Supposing a tunnel to be made through the earth in the direction of its centre, and a cannon ball to be dropped into it, were it not for the resistance of the air (contained in the tunnel) it would pass the centre, proceed by its momentum to the opposite side, then return, and continually occillate from side to side. But if we suppose the cannon ball to meet with the resistance of the air, each occillation would be diminished, and the ball would ultimately rest in the centre.

The cause of the seasons, and the variation in the length of the days and nights, were clearly exemplified, first by a horizontal tellurion, which exhibited the earth in its different positions, with respect to the sun, by a small globe revolving about a lamp in the centre; the axis of the earth being inclined to the plane in which it revolved, presented during its progress different portions of its surface to the light.

These subjects were further illustrated by the exhibition of a large coloured transparency of the earth, and subsequently by a magnificent vertical tellurion, in which the sun, the zodiacal signs, and half of the earth, were illuminated. The splendid effect of these transparencies in the darkened theatre were most imposing; the sun which revolved upon its axis was of dazzling brilliancy; and the earth, was observed proceeding gradually round the Sun, producing the seasons, and all the phenomena connected therewith; while its motion on its axis beautifully illustrated night and day, as well the rising and setting of the sun.

[At the conclusion of the lecture, Robert M'William, Esq. who presided during the evening, announced to the members that Mr. Wallis's Second Lecture would be delivered on Wednesday next, the 12th instant; and that the present lecture would be repeated to a different portion of the Members on Friday, the 7th. The Second Lecture would be repeatcd on Friday the 14th.]

Artificial Anatomy.—A young physician, Dr. Auzoux, of Paris, has by extraordinary ingenuity, study, and perseverance, succeeded in perfecting a complete artificial anatomy of the human body. The material of which it is made, is of a vegetable nature, nearly as hard as wood, but less frangible; which can be moulded into the most delicate forms, which the human body assumes in its various parts. It is said to represent every thing relative to anatomy; muscles, veins, arteries, viscera, bones, &c, and all displayed in their natural colours. Over the whole is placed a covering made to represent the skin, upon removing the skin the sub-cutaneous veins, and the superficial layer of muscles, become visible. Then, by removing each muscle separately, (and with it, the vessels and nerves that cover its surface) the subjacent parts are laid open: these being detached the naked skeleton is seen, retaining only a few muscles and vessels which it would be useless to remove. Each part is marked with a number and letters, referring to a synoptical table; so that it can be used without a demonstrator, and by this ingenious contrivance may be studied all the parts of which the body is composed, and learn their situation, size, shape, and functions. The brain can be taken out of the skull, and by means of the sections, examined to its inmost recesses. The eye being laid open displays its muscles, vessels, nerves, and membranes, the transparent parts imitated in glass, even the centralartery of the retina. It is probable that the results this admirable contrivance of Dr. Auzoux's, will prove of the utmost importaace in facilitating the study of anatomy; and likewise materially assist the artist in his delineations of the human frame.

Improvements in the Metropolis.—That part of London which lies between the King's Mews and Bedford Street, Strand, is to be made the site of a large and splendid quadrangle, the west side of which will be formed by the College of Physicians, and the Union Club House; the east side is to harmonize with the graud portico of St. Martin's Church, and on the northern side a new line of building will be erected; by this means, a full view of St. Martin's Church will be afforded from Pall Mall. In this quadrangle, it is intended the National Gallery for paintings shall be built, as well as the Royal Academy. The quadrangle will of course be open to Parliament Street and White-Hall, and it will be 500 feet in length from east to west, and an equal distance from the statue at Charing-Cross to the north side of the quadrangle.

Fishing Birds of China.—These Birds are employed on a celebrated canal in the Chinese empire, on which a prodigious number of rafts and small boats are used. Ten or twelve birds are attached to each raft, or boat, and on a signal being made by the owner, they dive into water and bring up fish, sometimes of an

enormous size between their bills. They seem so well trained as to require neither ring nor cord to be put round their throats, to prevent them from swallowing any part of their prey, but were content to wait for what their masters chose to give them.

LABOUR.—It has been computed by political arithmeticians, that if every man and woman would work for four hours each day in something useful, that labour would produce sufficient to procure all the necessaries and comforts of life; want and misery would be banished from the world, and the rest of the 24 hours would be leisure and pleasure. *Franklin* (Co-operative Magazine 2).

LIST OF NEW PATENTS.

CAPSTANS AND WINDLASSES.—To James Fraser, of Houndsditch, London, for improvements in capstans and windlasses. Dated, 25 Feb. Two months to enrol specification.

"TO PRESERVE VESSELS."—To B. Newmarch, of Cheltenham, "for certain inventions to preserve vessels, and other bodies, from the dangerous effects of external or internal violence on land or water, and other improvements connected with the same." 25 Feb. Six months.

DECAY AND DRY-ROT.—To B. Newmarch, of Cheltenham, "for a preparation, to be used either in solution or otherwise, for preventing decay in timber or other substances, arising from dry-rot or other causes."—25 Feb. Six months.

DISTILLATION.—To James Eraser, of Houndsditch, London, for a new and improved method of distilling and rectifying spirits and strong waters. 4 March. Two months.

CROSSING RIVERS AND VALLEYS.—To Robert Midgley, of Horseforth, near Leeds, for a method, machinery, or apparatus for conveying persons and goods over or across rivers, vallies, &c. 4 March. Six months.

COMBING WOOL AND SILK.—To George Anderton, of Chickheaton, Yorkshire, for certain improvements in the combing and dressing of wool and waste silk. 4 March. Two months.

GENERATING STEAM.—To James Neville, of New Walk, Shad Thames, for a new and improved boiler, or apparatus for generating steam, with less expenditure of fuel. 14 March. Six months.

PRODUCING LIGHT.—To Nicholas Hegesippe Maniclor, of Great Guildford Street, Southwark, for a new preparation of fatty substances, and the application thereof to the purposes of affording light. 20 March. Six months.

TO OUR READERS AND CORRESPONDENTS.

Unavoidable causes obliges us to omit in the present Number, the continuation of the History of the Steam Engine, but it will be resumed in our next.

The Article sent to us by AN ENGINEER is strictly an *Advertisement*; it cannot therefore be inserted.

We cannot at present answer the questions of W. C. but he may satisfy himself on all the points, by an inspection of the drawings attached to the Specification, in the Enrolment Office, Chancery Lane.

INVESTIGATOR is recommended to communicate with the Inventor of the "Simple Lamp for burning Fat," who is now we understand having some made for sale.

Most of the subjects proposed to us by F. R. will shortly appear; the first-mentioned (Jeffery's Patent Flues) was given in our 55th Number.

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REGISTER

OF

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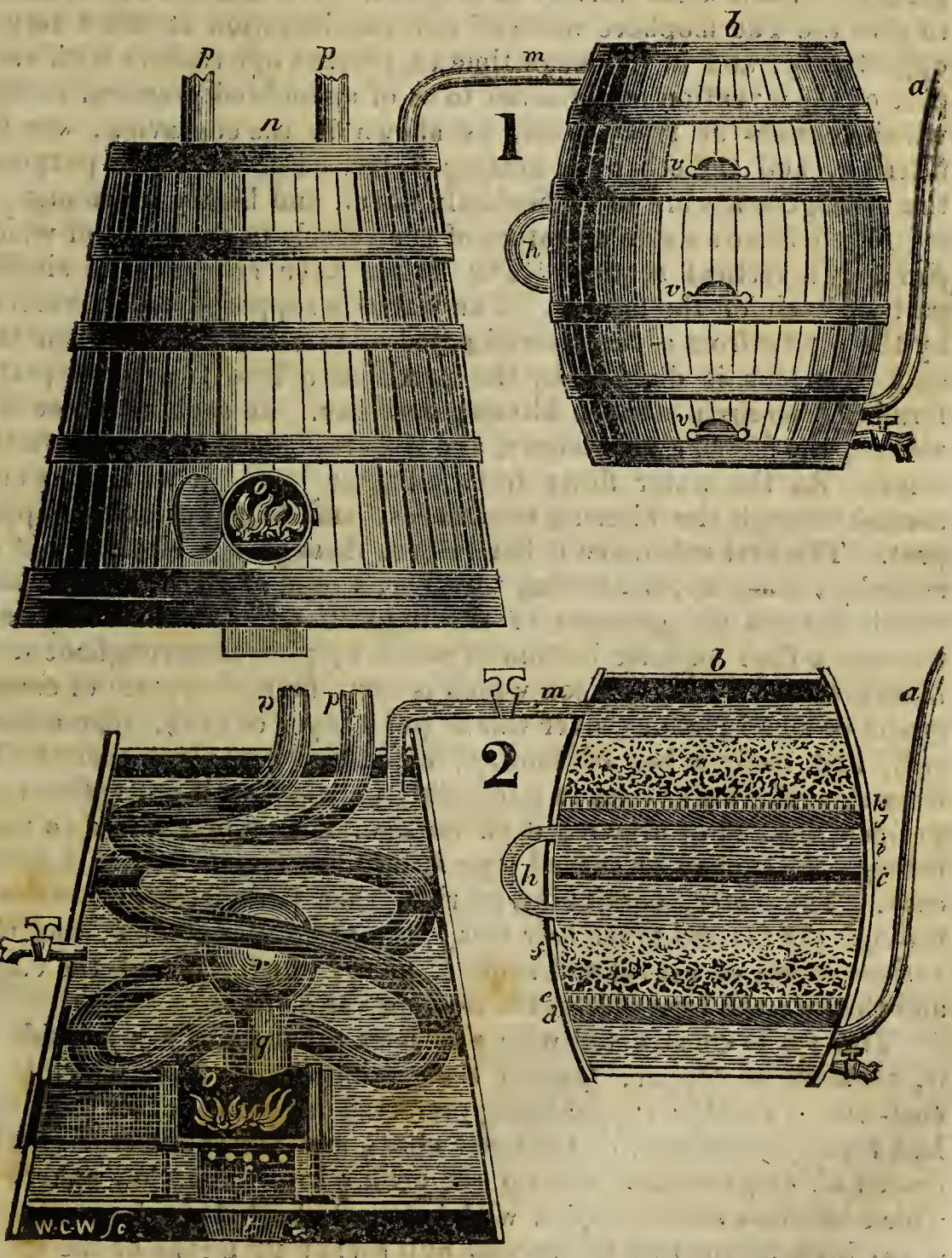
CONTENTS:

Suwerkrop's Patent Machines for filtering and heating Water 306
Hiort's Patent Chimnies,..... 307
Harrington's Raft for transporting Timber ib.
Patent Mode of Hot-pressing by Steam 308
Stevenson's Patent Axletrees & Bearings.. 309
On the Recovery of Land from the Sea.... 310
Sugar from the Beet-root..... 311
Method of Eradicating the Stumps of Trees ib.
Yardley's Patent Apparatus and Process of Manufacturing Glue from Bones..... 313
Navigation of Rivers..... 314
London Mechanic's Institution, Mr. Wallis's Second Lecture on Astronomy 315

Newly-discovered Island, 317—African Travellers, ib.—The Solar Spots, 318—Astronomical Tables, ib.—Preservation of Ship's Copper, ib. Labour of a Horse, 319.—Improved Mariner's Compass, 320,—French Engravings, ib,—Do. Paintings, ib.—Sculpture, ib,—Gymnastic Exercises, ib.—Correspondents, ib.



SUWERKROP'S PATENT MACHINES, FOR FILTERING AND HEATING WATER.

SUWERKROP'S PATENT MACHINES,

FOR FILTERING AND HEATING WATER.

The apparatus delineated in the frontispiece of our present number is only an appendage to a newly-invented machine, denominated a '*Thermophore, or Portable Mineral or River-water Bath, and Linen Warmer,*" which has been recently patented by John Hillary Suwerkrop, Esq. of Vine Street, Minories. The Thermophore itself appears to us to be of very doubtful utility in this country, and the necessary illustrative figures are so numerous, that we were rather fearful of introducing the whole subject together, which would have taken up a very large space in our columns to the entire exclusion, perhaps, of our usual variety of subjects. We therefore determined to give the Thermophore more of our consideration at some future opportunity, and in the mean time to present our readers with such part of the invention as appeared to us of undoubted practical utility, which consists of two vessels, as shewn in the engraving, one for filtering, and the other for heating water. For the latter purpose, the arrangements are to us perfectly novel, and highly ingenious.

Fig. 1 Shews a side elevation of the vessels in question, of which *fig.* 2 is a vertical section. The letters have reference to similar parts in each of the figures. The water is supposed to be received by the pipe *a* from a reservoir situated upon a higher level than the cask *b*, which is divided by the partition *c* into two equal parts, forming thereby a double filtering machine. In each of these divisions, the filtering substances, and the arrangement of them are the same. As the water flows from a higher level, it will of course ascend through the filtering substances, and flow out at the upper part. The first substance it has to pass through is a circular mat *d*, made by coiling up, and sewing together, a rope of platted horse hair, which detains the grossest of the impurities; from this it passes through a floor, or false bottom of wood, *e*, pierced throughout with numerous small holes; upon which is laid, first, a stratum of coarse gravel or small pebbles, over this is put a layer of finer, then a finer still, and lastly a bed of sand, *f*, about six or seven inches thick; from this, the water rises in a tolerably pure state; if not sufficiently purified, instead of drawing it off for use, it may be allowed to pass through the syphon or curved pipe *h*, into the upper division *i* of the cask. The water, continuing to rise, then percolates successively through the platted horse hair mat *j*, the perforated floor *k*, and the various strata of gravel and sand *l*, finally flowing out of the cask, and through the pipe *m* into the heating vat *n*.

This vat is constructed with a furnace *o*, and flue *p p p* inside of it, all made of copper, (except the grating for the fuel, which is of cast-iron as usual): copper being preferred on account of its oxidating less rapidly than iron, or the other cheap and suitable metals. The heated air or gases first rise up the neck *q* into the hollow sphere *r*, which becomes soon occupied with intensely heated air, from whence it has little disposition to descend and escape by means of the spiral

tubes, which finally become flues for the grosser products of the combustion; as these tubes, however, make a long circuitous course about the tub of water, the heat is almost wholly absorbed by it. The ingenious patentee has, indeed, been so exceedingly careful not to waste, if possible, a single particle of caloric, that the radiation of heat from the furnace through the grate bars, into the ash-hole, has not escaped his attention: accordingly he has availed himself of this, by passing a series of pipes through the chamber *s*, with merely a sufficient space between them to let the ashes fall through into the ash-hole *t*. The furnace and the flues are supported and kept in their positions by stays fixed to the side of the vat, as shewn. The three closed apertures in the cask *b*, (*fig.* 1) are for the several purposes of washing the bottoms of the horse-hair mats, by passing water through them downwards, and for taking out and refreshing the layers of gravel and sand when they have become foul by deposition from the water.

HIORT'S PATENT CHIMNIES.

The principal improvement contemplated under this patent, is the construction of chimnies with circular flues, or tunnels, which are to be within the usual thickness of the walls, and incorporated with the common brickwork. Each flue or tunnel, is to be surrounded by cavities commencing at the back of every fire-place, and connected with each other. The air within these cavities is, by the heat of any one fire, rendered sufficiently warm to prevent condensation within all the flues contained in the same stack. These flues from the peculiar form of the bricks of which they are constructed, may be carried to any extent, either perpendicularly or horizontally, and can be adapted to any turn or bend, without the smallest deviation from their original form and capacity, or producing any internal angles. Unlike the common square flues, these tunnels may all be cleansed by machines, and the necessity for climbing boys is thereby superseded; indeed from the inside face of the bricks being vitrified, very little adhesion of soot can take place.

HARRINGTGN'S PATENT RAFT FOR TRANSPORTING TIMBER.

The keel, stern-post, and lowest timbers of the ribs are to be formed and put together according to the usual way of constructing an ordinary ship. To form the bottom, balk timbers are to be laid together, side by side, lengthways of the vessel, and athwart these others are to be closely laid, cutting their ends to suit the figure, then bracing the upper and lower layer of timbers together. In this manner the lower parts of the vessel are to be formed, by packing the timber, crosswise closely, and connecting them by bolts and screws, leaving proper spaces open for stepping in the masts. In the upper part of this raft, as it is called, suitable births and cabins

are to be provided for the navigators; the outside is to be planked all over, and caulked, pitched, and tanned in the usual manner; the masts and rigging are also to be of the ordinary kind.

The patentee being, perhaps, the first who has made a raft, or rather ship, on this precise plan, probably considers, that having taken out a patent, will confer upon him an exclusive claim to construct them. Were it not that we had determined to give some account of every newly-patented invention, as they came before us, we should most likely have omitted all notice of this singular *invention*.

PATENT MODE OF HOT-PRESSING BY STEAM.

To the Editor.

SIR,

HAVING observed in a recent number of the Register a new mode of hot-pressing by means of heated air, I have thought that some account of a new patent method lately introduced into this town, of conducting the process by means of steam-heated plates, might not be undeserving of a place in your useful publication.

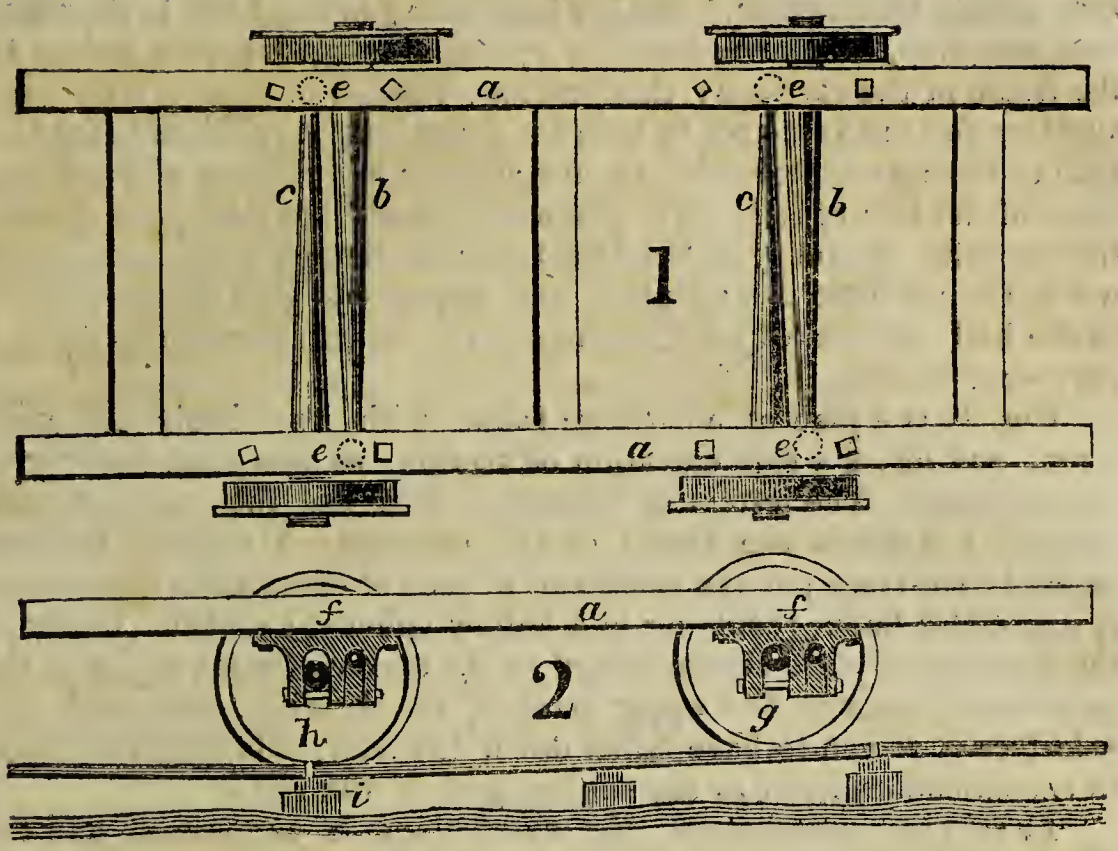
The plates are not made solid, but hollow, and consist of a top and bottom plate, each about an eighth of an inch thick, and placed three quarters of an inch apart; they are prevented from being collapsed by the pressure, by having vertical supports in the interior, which resemble a number of partitions dividing it into a great many little cells, with an opening from one to the other for the free passage of the steam; the top and bottom surfaces are connected together by a rim made steam tight. Through this rim is introduced a small tube on one side of the plate, with three joints to it, which allows the plate to descend as the pressure operates. Each of the steam plates are thus provided with jointed tubes, and they all communicate in common with a large vertical tube or main pipe, through which the supply of steam is obtained from a boiler, by turning a stop cock. Thus every plate is immediately filled with steam of any required temperature, and when the heat given out is considered to be sufficient, the supply may be stopped by turning back the stop cock to its former position: and if it be desired to cool the plates speedily, they may be instantly filled with cold water, by turning the same stop cock in a reverse direction to that by which the steam is let on, the cock having *three ways*, which admits of either cold water or steam being turned on, as may be desired.

On the opposite sides or edges of these plates, a stop cock is fitted to each, through which the water is allowed to run off in a trough. I submit that this mode of hot-pressing is preferable to that described by your correspondent L. H. as the temperature may be more easily regulated, and be rendered equable throughout the press.

Your constant Reader,

Manchester, S. P.

18*th March,* 1826.



STEVENSON's PATENT AXLETREES AND BEARINGS.

The patentee of this novel and seemingly valuable invention is Mr. Robert Stevenson, (late of Newcastle-upon-Tyne, but now) of Bridge Town, near Old Stratford, Warwickshire. The principal objects of it appear to be two-fold: *first*, to remedy the extra friction caused in railways, and carriages, when the latter are proceeding along the curved portions of the line, by which the wheels on one side of a carriage have to travel faster, than those on the other; which, as is well known and understood, causes a considerable rubbing, and consequent *wearing away* of the surfaces in contact.

To provide a remedy for this common defect of the ordinary tram-roads, or edge railways, the patentee proposes that, instead of two wheels placed as usual upon the extremities of one axletree, there shall be separate axletrees to each wheel; so that they may revolve independently, and at different velocities, as circumstances may require. The two outer wheels of a four-wheeled carriage (or those which are on the longest of the two curved parallel lines) will therefore be at full liberty to run faster than those on the inner side (or on the shortest line); thereby preventing that sliding motion, and the destructive consequences otherwise resulting from the curves, which are generally unavoidable in extensive lines of road.

The *second* object of the patentee was to provide a remedy for the unequal strain which a carriage is subjected to in passing over those parts of a railway that lie hollow, or below the level of the contiguous parts, (owing to the sleepers or other supports having sunk or given way), which causes the carriage and its load to rest upon three wheels instead of four. The remedy proposed consists of a

very simple contrivance. Each wheel being firmly fixed to its separate axle-tree, the latter turns in a fixed bearing, which is bolted to the frame of the carriage; this bearing, instead of having a circular aperture for the axle-tree to turn in, has a long vertical slot, for the axle to rise up and down in, as may suit the undulations or imperfections of the line of rail. This, however, could not take place unless the opposite extremity of the axle-tree moved upon a universal joint, which the patentee has adopted, and appears to give the preference to the ball and socket joint, on account of its extreme simplicity and easy application.

Fig. 1. is a plan of a carriage frame with its wheels and axle-trees, and *fig.* 2 a side elevation or section, *as seen from the interior of the frame.* The letters of reference used are the same in each figure. *a a* shews the frame of the carriage; *b c, b c,* the four tapered axle-trees; at the small end of each of these axle-trees *e e e e* is a globular knob, revolving in a hollow spherical socket. In *fig.* 2 the bearings *f f* are shewn bolted to the carriage frame *a*; at *g* the axle-tree is seen in the upper part of the bearing, and at *h,* the axle-tree is shewn to have fallen down the slot, allowing the wheel to accommodate itself to the sunken part of the rail *i.*

In this last contrivance, the wheel alone is supported, and the carriage has still to sustain the unequal pressure owing to its resting upon only three wheels; the chief advantage that results from it, is in keeping the wheel always upon the rail; because, if the hollow was so great, as to allow the flanch to rise above the surface of the rail, the carriage might in its progress be thrown over, producing very serious consequences.

On the recovery of Land from the Sea.—In Mr. Blackburn's recent pamphlet on this subject, he says, (page 19) that "in the space of a few years, during the protectorate of Cromwell, 425,000 acres of fens, morasses, and overflown lands, were recovered in Cambridgeshire, Lincolnshire, Hampshire, and Kent, of which Col. Vermuyden, a Fleming, was the principal undertaker, and of whom Harté justly says, "few statesmen and generals have better deserved a monument.'.

The same author observes, that Mr. Loudon, in his work on gardening states, there are yet about three millions of acres (or one fifteenth part of the whole country) on the English and Scotch Coasts which might be recovered and added to the kingdom, and which would prove as valuable land as any part already in cultivation.

It has been objected by some, that a considerable portion of this land would not be worth recovering; this, however, is a mistake: Mr. Loudon (than whom no man is better qualified to give an opinion on this subject) says, that "no kind of land whatever, can be gained from the sea that is not valuable, because it can be flooded at all times by the sea, and frequently by fresh water. By flooding, the most barren land, with only an inch or two of soil, will bear excellent pasture; and much land that is often reckoned barren and useless, is partly

composed of broken shells, which contain considerable portions of calcareous earth, admirably adapted for productiveness." The recovered land frequently consists of soil from three to four feet in depth, containing fine vegetable matter, the remains of sea-weed, marine animals, and other substances deposited by the tide, saturated with salt, and so extremely fertile, that, in many instances, it has been cropped for twenty years successively without manuring.

On the general practicability of embanking, Marshall observes, that the theory of embanking is beautifully simple. The pressure of water against the sides of the vessel containing it, being, as its depth, it follows, that a bank of any materials whatever impervious to the water, whose section is a right-angled triangle, and the height of whose perpendicular side is equal to that of the water it is to dam in, will balance or resist that water, whatever may be its breadth; therefore, as width or extent is concerned, it is as easy to exclude the Atlantic Ocean as a small pond, or a river a few yards wide; and where embankments are made with skilful regard to their situation, direction, construction, and materials, they have never been known to fail.

Sugar from the Beet-root.—The extraction of sugar from beet-root is still practised in many parts of France with great success. Various improvements in the culture have been lately introduced; and M. Beaujeu, who has lately written a treatise on the subject, which was read at a recent meeting of the Academy of Sciences, considers, that a small plantation of beet-root, for the purpose of extracting the sugar, to be an indispensable portion of every farm.

METHOD OF ERADICATING THE STUMPS OF TREES.*

In the clearing of woodland the extirpation of stumps and roots is the most laborious part of the process. In British America the ordinary method is to allow the stumps to remain for a number of years, according to their size. During this period the smaller fibres gradually decay, and the root itself is each year removed a little from its original position by the frost. When the farmer judges that time has so far produced decay as to render the removal of the stumps and roots practicable by the usual means, he pitches upon the spring of the year when the soil has been loosened by the returning heat, and with the assistance of four or five men, and a couple of pairs of oxen, he effects his purpose, by a great deal of labour, and under a disadvantageous application of the power, owing to the softness of the ground.

In 1821, J. Mackay, Esq. of Pictou, Nova Scotia, cut down the trees and removed the timber from a field of 10 acres. The following

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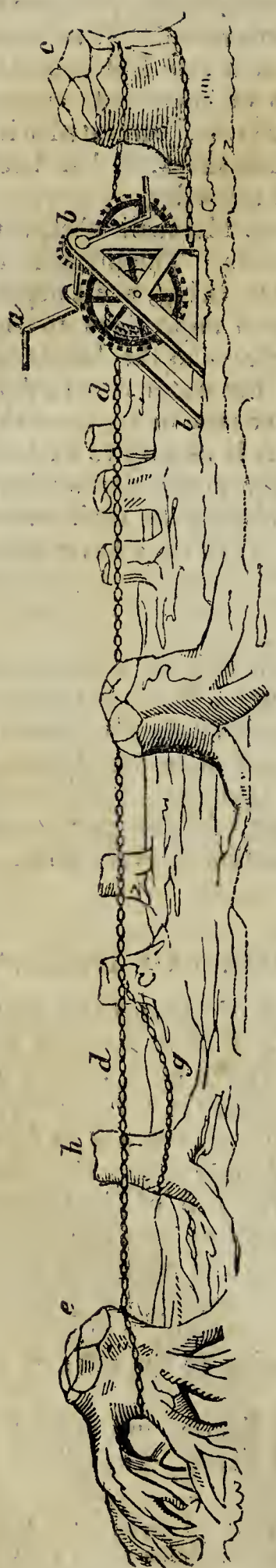
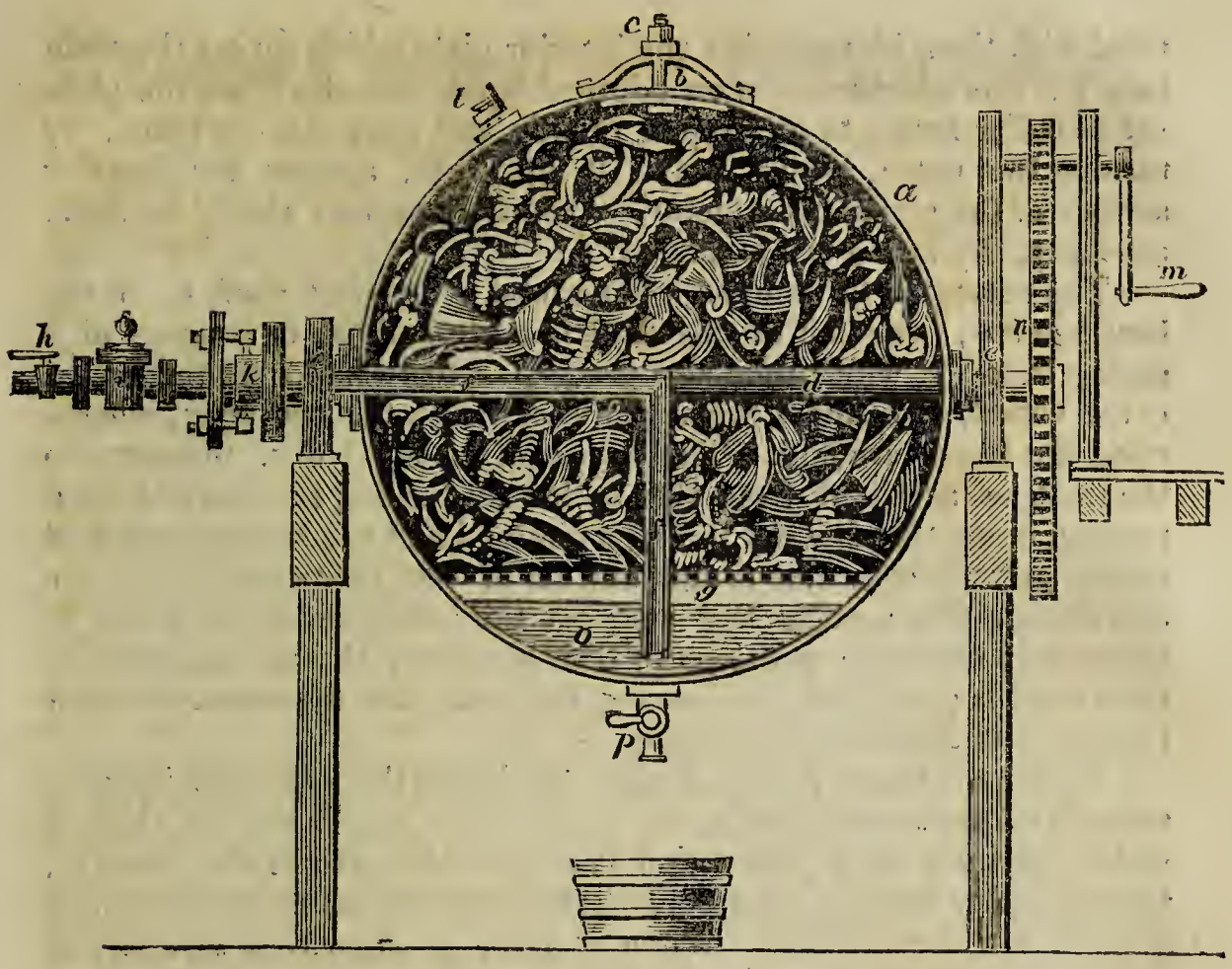
* Abbreviated from the Transactions of the Society of Arts. The Gold Ceres Medal was voted to Mr. Mackay, for the communication of his plan to the Society.



were the means adopted by that gentleman for clearing the ground of the stumps and roots, which proved so effectual that, with the assistance of four men, he cleared, upon an average, 80 stumps a day, and with them every root which could impede the progress of the plough.

A ship's winch, or moveable crane, was the machine used for gaining a great mechanical power; this was brought into the middle of about an acre of stumps, and fastened to the largest of them. From the barrel of the winch a chain proceeded, which extended to the farthest stump in the piece; a number of shorter chains were also provided, each having a ring at one end, and a hook at the other. By passing the hook through the ring, they were fixed upon the stumps nearest to that to which the chain of the winch was attached, and when it was raised these chains were in succession hooked to the leader, so that the winch was employed without interruption, till the nearest stump was extracted. In clearing Mr. Mackay's field five hands were employed; two at the winch, two in fixing the chains, and one at the stump to be raised. When the stump was large, those who attended the chains occasionally assisted in turning the winch.

Reference to Engraving.—*a a* the two winch handles of the frame *b b*, which is chained to the largest stump, *c*; *d d* the leading chain, proceeding from the barrel to a distant stump *e*, which is in the act of being raised. *g* a shorter chain round the stump *h*, to be hooked on to the leading chain *d d*, as soon as it has raised the stump *e*, and has been disengaged from it, so that the different stumps are raised in succession from the farthest to the nearest. The winch is then removed to face the next portion, and the chain extended to the farthest it can reach, while the shorter chains are attached to the right and left stumps, and hooked on in succession to the leading chain, and thus continued until a whole circle round the winch has been cleared. Should the stump to which the winch is attached be liable to give way, it will be requisite to lash it to one or two in the rear, to secure the purchase.



YARDLEY'S PATENT APPARATUS AND PROCESS OF MANUFACTURING GLUE FROM BONES.

As it has been well known by chemists for more than half a century, that bones contain about one half of solid gelatin, besides a considerable portion of fat, it is somewhat surprising, that our manufacturers should not have availed themselves until lately of those valuable products for a variety of purposes.

The above apparatus is the subject of a recent patent granted to Mr. Charles Yardley, of Camberwell : the figure gives a section of the principal vessel. *a* in which the gelatin is extracted from the bones, by the action of steam at a high pressure. It is in shape, a hollow globe, or sphere ; of great magnitude, and made of cast or wrought iron. Copper should not be used, as gelatin has a powerful chemical action upon that metal.

The first part of the process is to cleanse the bones by immersing them in water in a pit or cistern, where they are to remain for about twelve hours ; the water is then to be drawn off, and fresh water added to them ; this operation may be repeated several times to get rid of the adhering dirt. The water being withdrawn from the bones, a solution of lime, in the proportion of one bushel of the earth to 500 gallons of water, is to be poured into the cistern, for the more perfect cleansing and removal of superfluous matters. After three or four days' saturation, the limy solution should be drawn off, and fresh water added to get rid of the lime. Thus prepared, the bones are brought to the globular vessel *a* called the extractor, which is

filled with them by removing the interior plate which covers the main hole *b*; this aperture is of an eliptical figure, which allows the plate (of a similar form) to be slipped round, and refixed in its place, by turning the nut *c*, which draws it up tight, against the interior surface of the globular extractor, when the aperture should be made air-tight, by luting the junctures.

The extractor turns upon a horizontal cylindrical shaft *d*, in the bearings *e e*; one half of this shaft is made hollow, or consists of a strong tube *f f*, which tube also proceeds downward, from the centre of the vessel, to conduct the steam underneath the grating *g*, whereupon the bones are laid. The steam of about 15lbs. pressure to the inch is admitted from the boiler by turning the cock *h*, and passing along the pipe, by the safety valve *i* and the stuffing box *k*, it enters and proceeds first to the bottom of the extractor, then rises up through the grating and amongst the bones until the vessel is completely charged; previous to this however, the air contained in the vessel is got rid of, by opening the cock *l* for the steam to blow through and afterwards closing it.

Whilst the steam is acting upon the bones the extractor is occasionally turned round gently, by hand at the winch *m*, the shaft of which carries a small pinion that takes into the teeth of the wheel *n*; and the latter being on the same shaft as the extractor, consequently gives it a rotary motion. When at rest, as shewn, a quantity of fluid gelatine is collected in the bottom of the extractor at *o*, from whence it is discharged by the cock *p* into a tub beneath, after opening the air cock *l* to allow it to run off. This done, steam is again admitted from the boiler into the extractor, to act upon the bones for another hour, when the second portion of condensed liquid is to be drawn off.

When the products thus obtained have become cold, the fat which has formed upon its surface is to be carefully removed by skimming, and the gelatinous portion only is to be returned into the extractor, by means of a funnel at the cock *l*. The steam is then re-admitted to the extract, to act upon it for another hour; after which it is finally drawn off into other vessels, to undergo a simple evaporating process until it arrives to a proper consistence to solidify when cold; previous to which some alum is added to clarify it. When the gelatine has become cold and solid, it is cut out into square cakes and dried as usual upon nets in the open air.

Navigation of Rivers.—An account is given in the French papers, of a M. Lagnel, who it is said has constructed a machine, which is at present at work on the Rhone, by which he contrives to tow vessels against the stream at the rate of three quarters of a league in the hour; the ordinary rate of vessels towed by horses being 2½ or 3 leagues a day. No description of its construction is given, but a model is stated to have been sent to the French Academy of Sciences.

London Mechanics' Institution,

WEDNESDAY, 12th of APRIL, 1826.

MR. WALLIS'S SECOND LECTURE ON ASTRONOMY.

TIME—SOLAR AND SIDEREAL. THE MOON;—HER ROTATION,—HER PHASES,—HER LIBRATIONS,—HER ORBIT,—HER NODES,—AND THE CONNECTION OF THESE WITH THE OCCURRENCE OF SOLAR AND LUNAR ECLIPSES.

The interest excited by the announcement of the course of lectures was increased by the delivery of the first, and the Theatre was in consequence completely filled.

Mr. Wallace commenced by observing, that in the preceding lecture he had considered the striking phenomena of the Earth, from which they were enabled to conclude that it was a planetary body, revolving on its axis and round the sun; from which two motions all periods of time were calculated: the diurnal motion on its axis forming the standard of time. The motion of the earth on its axis was completed in 24 hours, and this being measured by the apparent motion of the sun, is called solar time. Time measured by the stars is called sidereal time, and differs from solar time, there being 366¼ sidereal days in the annual revolution, and 365¼ solar days. The reason of this is, that the earth, in consequence of its motion on its axis, loses one rotation in the course of its revolution round the sun; being a loss of 3 minutes 56 seconds each day. This cannot take place in time measured by the stars, which are seen at immense distances beyond the earth's orbit. The computation of time by the sun was difficult from different causes: the adjustment of that difference was called the equation of time. The earth moves in an oval orbit. The sun is not in the centre of the orbit, but in one of the focii; and the earth is three millions of miles nearer the sun on the 7th of January, than on the same day in July; the mean distance being 95 millions of miles, this difference is about one thirtieth of the whole. The least distance is called the perihelion; the greatest aphelion.

From the laws of gravitation it arises that the earth cannot move regularly at all times; and this irregularity, and its moving in an elipsis, makes a difference in the length of the day as measured by the sun and a star. The ecliptic, or sun's orbit, is inclined to the equator in an angle of 23½ degrees; and the sun does not complete his apparent revolution in even days, both of which increase the difficulty of measuring solar time. The sun's apparent revolution is performed in something less than 365¼ days. In the reign of Julius Cæsar it was appointed, by the advice of the astronomers of that time, that one day should be added to the year every fourth year, which then consists of 365 days and is called leap year, which method of computation was from that time called the Julian period. It was since found that they over-reckoned the excess of the solar year above 365 days, which does not quite amount to a quarter of a day, and on the change of the style is this country it was found necessary to take eleven days out of the calendar, which had been added in consequence: therefore, in the course of every five centuries, three leap years are to be omitted, which in that period will keep the computed time within two hours and sixteen minutes of the real time; when that difference amounts to a day it must be allowed for, which difference being so small in five centuries, will take a very long time.

The Lecturer here exhibited a transparency for the purpose of explaining the cause of the difference between sidereal and solar time.

The sun was placed in the centre with the earth revolving round it, and also on its axis; a star was seen at a distance; and it became apparent that as the earth moved on its axis and in its orbit, the sun appeared to come later than the star to the meridian each day, by which one day was lost in the period of the earth's revolution round the sun.

The Lecturer next called the attention of his auditory to the moon, which is called a secondary planet, because it revolves round a primary planet, the earth. It was comparatively small, though it appeared of equal magnitude with the sun; but this arose from their different distances from the earth. The sun being 95,000,000 miles distant; the moon but 240,000 miles. The moon's distance from the earth was determined by what is called the parallactic angle of the moon, which was formed by lines passing from opposite points of the earth's surface to opposite points of the moon's surface, and crossing each other, which formed the parallactic angle, by which it was ascertained that the proportion of the moon's diameter to that of the earth was as 1 to 3.69 and, as the earth's diameter was known to be 7,912 miles, that of the moon was easily discovered. The surfaces of globes being as the squares of their diameters it becomes easy to ascertain how much larger the earth is than the moon. The square of 1 the moon's diameter, was 1: the square of 3.69, the earth's diameter was about $13\frac{1}{2}$, which gave the proportion. To find the relative bulk the cube of the diameters should be taken, which for the moon was 1, for the earth $50\frac{1}{4}$, which gave the real difference of size. Supposing the earth to reflect the sun's light as well as the moon; it gives the moon $13\frac{1}{2}$ times the light we receive from her. It might appear improbable that the earth should reflect light; but if the moon was compared with bright clouds by day, she would not appear brighter; and if the moon when rising before the sun set, was compared with a distant white house on which the sun shone, she would be found not so bright. There was no reason to suppose that the earth was less capable than the moon of reflecting light. At the time of the new moon, if it did not then receive light from the earth it would be invisible, which was not the case. The moon revolves on its axis in the same time in which it revolves round the earth; the consequence of which is, that the same side is at all times turned towards the earth, and receives its reflected light. The moon moves round the earth in an elliptical orbit, and is, in consequence, sometimes nearer than at others: the difference being in the proportion of 28 to 32. When most distant she is said to be in her apogee; when least distant in her perigee. A consequence of this is, that she sometimes moves quicker in her orbit than at other times. At one time of her period she passes over 14° in 24 hours; at another, but 11°. From the moon the earth must present a singular appearance. To those who live on the moon's centre, as visible to us, the earth would appear to be fixed, only turning on its axis; while to those on the moon's limbs the earth would be seen in their horizon. The moon being globular was shewn by its phases; and its being an opaque body by its darkness, when not illuminated by the sun's light. An opaque body revolving on its axis would present all the appearances the moon does to us. This was illustrated by the exhibition of a globe representing the moon, one half its surface being black, the other bright, and revolving on its axis in a plane, which successively exhibited the phases presented by the moon to the earth. A model was also exhibited representing the ecliptic, and also the moon's orbit when in opposition to, and in conjunction with the sun's, by which it was shewn that the moon did not move in the ecliptic, but in an orbit inclined to it, and intersecting it at points called the nodes, which contrivance prevents eclipses taking place at every conjunction and opposition. The inclination of the moon's orbit is called the moon's latitude.

A transparency was exhibited, in which the earth was represented in the centre, surrounded by moons in different parts of the moon's orbit, which being illuminated by the distant sun represented all the several phases of the moon as seen from the earth; and also shewed that the moon was of a globular figure, and only shone by a reflected light.

Another transparency exhibited the earth in the centre, and the moon revolving round her, but fixed on her axis, by which all the moon's surface became successively visible to the earth, contrary to what is observed in nature. The moon was then seen to revolve on its axis in the same time it revolves round the earth, and to keep the same side constantly towards the earth, which is the appearance of nature.

Another transparency exhibited the moon soon after the change, when but a small portion appeared illumined by the sun; and the earth being a

full moon to the moon, faintly illuminated the remainder; presenting an appearance which has been called, the old moon in the new moon's arms. Several transparencies were exhibited representing drawings taken of portions of the moon's surface, by means of telescopes of great power, which shewed considerable differences in the degree of light reflected from different parts of its surface; caused, as was supposed, by high mountains and deep valleys.

Another transparency exhibited the sun in the centre, the earth revolving round him, and the moon round the earth, with their proper relative velocities; and illustrated the causes of solar and lunar eclipses. When the moon comes to the eliptic at the time of the nodes, she enters the earth's shadow, and is eclipsed: when she passes between the sun's rays and the earth, she partially eclipses the sun. The greatest number of eclipses that can take place in a year is seven, the smallest number two. If solar eclipses be well observed, the longitude of places may be determined by them with great accuracy. A total eclipse of the sun can only last eight minutes at any one place; a total eclipse of the moon may last nearly four hours. The lecture concluded by the representation of a central and annular eclipse of the sun, which is a very rare phenomenon to any given place, and it occurs when the sun is at its least, and the moon at her greatest, distance from the earth, the moon is seen surrounded by an annulus of light, presenting a most striking and beautiful appearance.

The great talents evinced by the lecturer, joined to his clear articulation and impressive manner, rivetted the attention of the crowded assembly; while the splendour of the numerous transparencies, and the extraordinary ingenuity exercised in producing the various and combined movements of the planetary bodies, excited from all present the warmest demonstration of applause and admiration.

Before quitting the Theatre, Mr. Wallis said he wished to mention an occurrence that had taken place since he delivered his first lecture, though it might appear to relate to himself personally. He stated that he had received a letter from a person, whose name he thought it unnecessary to mention, censuring him for having made a reflection expressive of admiration at the wisdom of the Author of Nature in the course of his lecture. He felt that he was addressing moral as well as intellectual natures; and he hoped it could not be thought unreasonable that he should give expression to the feelings of admiration and delight excited by the contemplation of a system of nature that led the mind beyond the trammels of atheism, to look through Nature up to Nature's God. He mentioned the occurrence, because he felt that in the course of the lectures he might again be compelled by his subject to give expression to similar reflections.

The unbounded applause with which this address was received, has clearly proved that the respectable lecturer has nothing to apprehend from the indulgence of his piety.

Discoveries & Processes in the Useful Arts.

Newly-discovered Island.—In July last, Capt. Eeg, of the Dutch sloop of war, Pollux, discovered a new and well peopled island in the Pacific, to which he gave the name *Mederlandich Island*. Latitude 7° 10′ south. Longitude 177° 33′ 16″ each from Greenwich. Natives athletic, fierce, fearless, thievish, and apparently unacquainted with the effects of fire arms.

African Travellers.—Captains Clapperton and Peace, and Messrs. Norrison and Dickson, have sailed in the Brazon, for the Bights of Benin and Behara, where they intend to land and prosecute their interesting enquiries.

The Solar Spots have been of greater magnitude during the past month, than for many months preceding; the nucleus of one, which could not have been less than 22,000 miles in diameter, was broken into three distinct pieces, the umbra having a defined circular boundary. In the short space of a few hours a furrow was observed proceeding from this spot, and extending itself with astonishing rapidity to a distance equal to the greatest length of the source from which it issued. These appearances indicate the existence of a more powerful agent than any that are analagous to the earth.

Without insisting on the hypothesis, it is merely surmised, whether the conjunctions of Mercury and Venus, which occurred on the same day (10 March) and at the same time, that the spots were traversing the sun's disk, might not have some connexion with this phenomena; it will appear from the following reasoning, to be as rational as many theories which have been advanced to account for these astonishing appearances in the solar orb.

We would first advert to the tides of the ocean, and the atmosphere of our earth, which are affected by lunar influence. The sun is agitated about the common centre of gravity of the whole system, which is not in the sun's centre, though never without its circumference. Mercury and Venus are not only the nearest bodies to the sun, but the densest in the system; for the density of the sun being taken as $1\frac{2}{15}$, Mercury will be $9\frac{1}{6}$, and Venus $5\frac{11}{15}$. The solar atmosphere is an elastic fluid, which extends to a height not less than 1843 miles, nor more than 2765 miles. Lastly, gravity or attraction, is as the distance and quantity of matter in bodies. May we not then infer that the combined action of these dense bodies, of so much greater density than the sun itself, and so near the sun, withdrew the solar atmosphere, and thus uncovered its opaque body.—*Journal of the Belles Letters.*

Astronomical Tables.—That indefatigable astronomer M. Schumacher, professor of Astronomy at Copenhagen (also editor of the *Astronomische Nachrichten,* or Astronomical Newspaper) has laid all astronomers under fresh obligations to him by the publication of the second part of his *Samlung von Hülfstafeln* which have been prepared for the purpose of reducing the 50,000 stars contained in Lalande's *Histoire Céleste;* serving, indeed, to effect the reduction of any of those stars in the short space of two or three minutes.—*See Report Lon. Astro. Soc.*

Preservation of Ship's Copper.—In a paper by Sir H. Davy in the last part of the Philosophical Transactions, it is mentioned that independently of the chemical, there is a mechanical wear of the copper in sailing, which on the most exposed part of the ship, and in the most rapid course bears a relation to it, of nearly 2. to 4.55. As the result of actual experiment, as to the electro-chemical means of preserving the copper sheathing of vessels, the President is led to conclude that the proportion of protecting metal should be from 1-90th to 1-70th; that the most advantageous way of applying protection will be under and not over the copper: the electrical circuit

being made in the sea-water passing through the places of junction on the sheets; and, in this way, every sheet of copper may be provided with nails of iron or zinc, for protecting them to any extent required. By driving the nail into the wood, through paper wetted with the brine above the tarred paper or felt, or any other substance that may be employed, the incipient action will be diminished; and there is this great advantage, that a considerable part of the metal will, if the protectors be placed in the centre of the sheet, be deposited and re-dissolved: so there is reason to believe that small masses of metal will act for a great length of time. Zinc, in consequence of its forming little or no insoluble compound in brine, or sea water, will be preferable to iron for this purpose; and whether this metal or iron be used, the waste will be much less than if the metal were exposed on the outside, and all difficulties with respect to a proper situation in this last case is avoided. The copper used for sheathing should be the purest that can be obtained, and in being applied to the ship, its surface should be preserved as smooth and equable as possible; and the nails used for fastening should likewise be used of pure copper, and a little difference in their thickness and shape will easily compensate their want of hardness. In vessels employed for steam navigation, the protecting metal can scarcely be in excess, as the rapid motion of these ships prevents the chance of any adhesions; and the wear of the copper by proper protection is diminished more than two thirds.

Labour of a Horse.—The following is one among the many useful tables contained in Mr. Tredgold's valuable work on Rail Roads, recently published; more important practical information could not well be included in so small a space.

A Table shewing the maximum quantity of Labour of a Horse of average strength, is capable of performing, at different velocities, in Canals, Railways, and Turnpike Roads.

Velocity in Miles per hour.	Duration of the Day's Work at the preceding velocity.	Force of Traction in lbs.	Useful effect of One Horse, working one Day, in tons drawn One Mile.		
			On a Canal.	On a level Railway.	On a good level Turnpike Road.
Miles.	*Hours.*	*lbs.*	*Tons.*	*Tons.*	*Tons.*
$2\frac{1}{2}$	$11\frac{1}{2}$	$83\frac{1}{3}$	520	115	14
3	8	$83\frac{1}{3}$	243	92	12
$3\frac{1}{2}$	$5\frac{9}{10}$	$83\frac{1}{3}$	153	82	10
4	$4\frac{1}{2}$	$83\frac{1}{3}$	102	72	9
5	$2\frac{9}{10}$	$83\frac{1}{3}$	52	57	7.2
6	2	$83\frac{1}{3}$	30	48	6.0
7	$1\frac{1}{2}$	$83\frac{1}{3}$	19	41	5.1
8	$1\frac{1}{8}$	$83\frac{1}{3}$	12.8	36	4.5
9	$\frac{9}{10}$	$83\frac{1}{3}$	9.0	32	4.0
10	$\frac{3}{4}$	$83\frac{1}{3}$	6.6	28.8	3.6

Improved Mariner's Compass.—Charles Phillips, Esq. of Upnor, near Frindsbury, Kent, has made some great improvements in the construction of that invaluable instrument, the ship's compass; as we purpose giving a precise description of them in an early subsequent number, we shall not here add any thing to this notice.

French Engravings.—M. Canel, a bookseller of Paris, has announced his intention of publishing a collection of engravings, from full-length portraits, of all the celebrated characters of the present time. M. Gerard, painter to the king of France, will have the superintendance of the work.

French Paintings.—The pictures of the late great French artist, M. David, are advertized for sale at Paris on the 17th of this month; they are to be exhibited for three days prior to the sale: our English amateurs have therefore no time to lose.

Sculpture.—Baily's beautiful statue of Eve, has been purchased by a public-spirited gentleman of Bristol, to prevent its going out of the country; the sculptor having, it is said, meditated sending it to the continent.

Gymnastic Exercises.—We are gratified to learn that the Gymnastic Society lately proposed to be formed by Professor Voelker, is nearly organised. The subscribers, it is said, are very numerous, and a piece of ground for the exercises, has been obtained at Islington, for temporary use, until all the arrangements are completed.

TO OUR READERS AND CORRESPONDENTS.

We regret the necessity we are under of renewing our apology, in this week's number, for another omission of our usual chapter on the Steam Engine; and we now feel it incumbent upon us to explain, that the gentleman who has undertaken to write for our work a complete series of papers on this subject, is, at present, in the north of England, where he has been detained, upon urgent business, a longer period than he had calculated upon. With the view of preventing disappointment, we are informed that a parcel, containing the manuscript and drawings for two successive numbers, had been forwarded to us: the parcel has not, however, come to hand; but, we confidently trust, that the subject will be resumed in our next, and be regularly continued, until completed.

In reply to J. B., Esq. we shall be much obliged by his proposed communication, as a complete invention of the kind he mentions, is of real importance.

D. N. has been received; we like the *out-line* of his plan: some of the details are not comprehensible, owing, perhaps, to the accidental omission of two or three little words. If he could make it convenient to call at our publishers', the parts alluded to might be explained.

Aquarius is informed that we purpose giving very soon a description of Mr. Cabanal's curious machine for raising water: very likely it will appear in our next.

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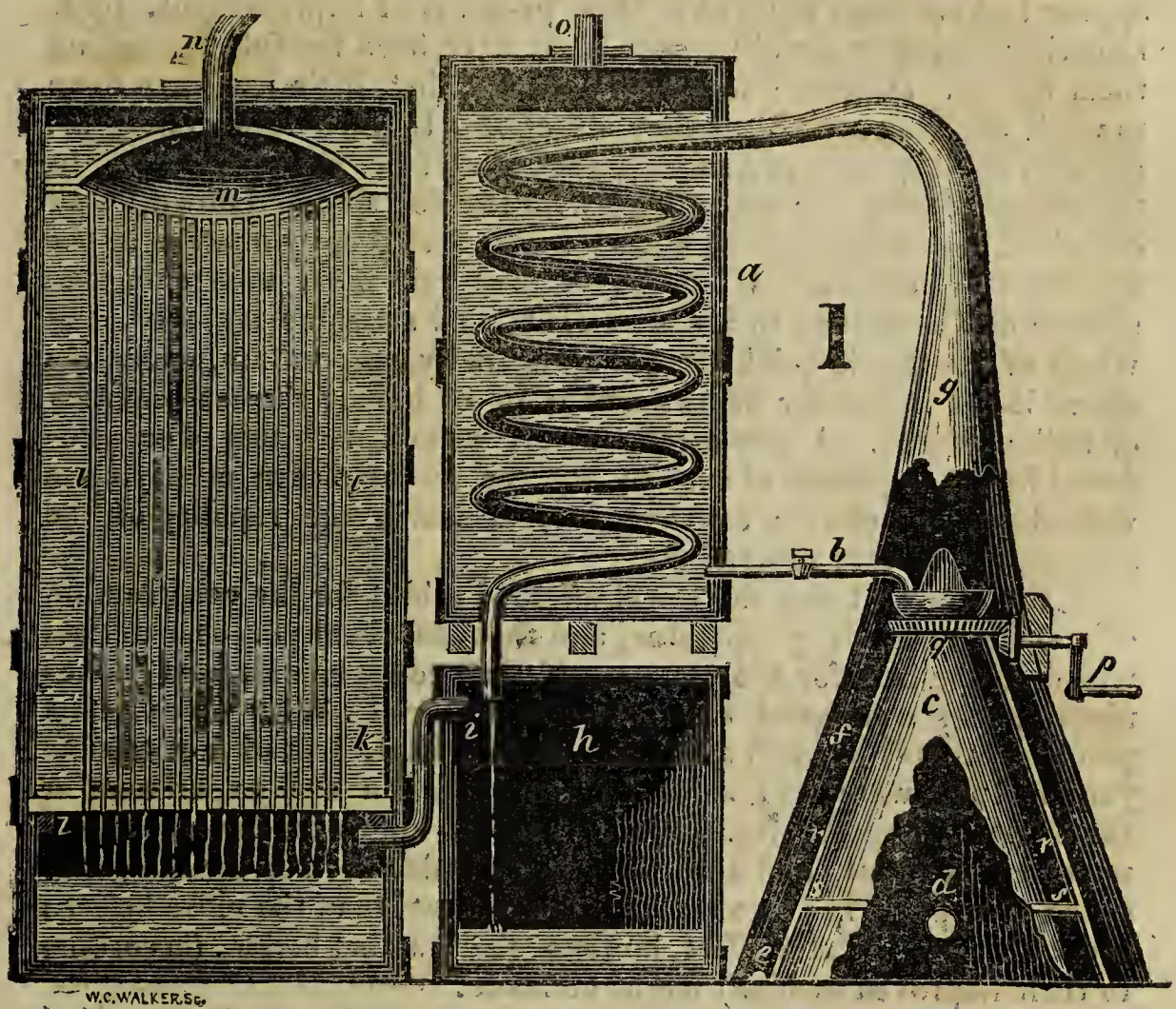
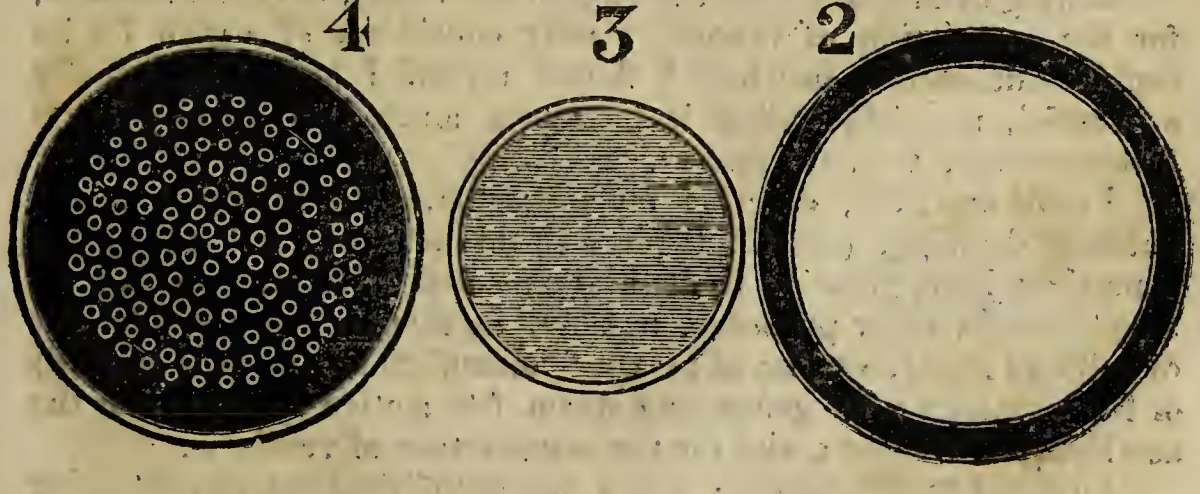
CONTENTS:

Improved Apparatus for Distillation and Evaporation 322
Palmer's Bisecting Guage 326
Cheverton's New Gas Power Engine .... ib.
London Mechanic's Institution, Mr. Wallis's Third Lecture on Astronomy 331
Painting in Milk, 333—Transmission of Sound, 334—Recipe for driving Insects from Trees, ib.—French Process of making Bistre, ib.—Etching and Cleaning of Alabasters, 335—To clean Alabaster Sculptures, ib.—New Glazing for Earthenware, 336—Voyages of Discovery, ib.—Flying Fish in the Channel, ib.—Correspondents, ib.





APPARATUS FOR EVAPORATION AND DISTILLATION.

IMPROVED APPARATUS FOR EVAPORATION AND DISTILLATION.

APPLICABLE ALSO TO SEVERAL OTHER PURPOSES.

To the Editor.

Sir,

In several numbers of your work, descriptions are given of a variety of newly-invented apparatus for the several purposes of generating steam; for evaporating generally; and for the distillation of spirituous liquids. The inventors, it must be acknowledged, have displayed considerable ingenuity in their contrivances, but they appear to have been fettered in their progress of improvement, by a lingering prejudice for old customs, or have been fearful of invading them too far at once; for we shall find that little has been done towards effecting the object they all appear to have been aiming at, namely, the exposure of a more extended surface, than heretofore, to the action of heat; in accordance with the doctrine laid down by all chemists, and agreeably to what we may almost daily observe in the operations of nature. When a shower of rain falls, moistening the surface of the ground to a wide extent, and sunshine succeeds, the whole of the rain is quickly taken up again by evaporation, excepting where it lies in greater depth, owing to its having run into cavities or hollow places. I was most forcibly struck with this effect produced by the exposure of surface, by the circumstance of drying a wetted towel before a common fire, in which the rapidity of the evaporation is very remarkable.

I then thought that the towel afforded a hint for the construction of a steam generating apparatus, and that absorbent porous materials would be the best for the purpose, if they could be arranged conveniently, and were good conductors of caloric. With my various plans to produce a good apparatus of this kind, I need not trouble you, as they were laid aside for consideration and experiment at some leisure opportunity. Since then, it appeared to me that I might adopt metal, and apply a very extended surface for the generation of vapour, in a manner more convenient, than the close boiler; and with vastly greater effect, however shallow that boiler, (according to their improved fashion) might be made.

Having determined upon the form of my vessel, or rather *machine*, for the production of vapour, I next considered of a plan for its rapid condensation, in which I flatter myself I have been equally successful, notwithstanding it possesses much less novelty in its arrangements, than the former.

I shall now, Sir, describe my apparatus, with reference to the enclosed drawing, (see frontispiece to this number) and at the same time shew its application to distillation; and afterwards explain its adaptation to other purposes, namely, for evaporating the solutions of salt and sugar, employed in the "manufacture" (as it is termed) of those articles; for generating steam for motive engines; for the acetifying of vinegar; and for the manufacture of verdigris.

First, as to distillation; *a* is a tall cylindrical vessel containing

the fermented "*wash*" to be distilled, which vessel is supposed to be regularly supplied by means of a pipe from the brewhouse. By turning the cock in the pipe *b*, the wash flows upon the *exterior* surface of the conical evaporator *c*; the liquid is first discharged into a small basin fixed round the cone near to its apex; which basin, having numerous minute perforations at the bottom, distributes the liquid equally over the whole surface of the evaporator in the thinnest possible stratum. The quantity of wash allowed to flow, may of course be regulated by the turning of the cock, and its uniform distribution may be assisted, if necessary, by spreading thin linen cloth, or wire gauze, (each has its peculiar advantages) over the surface of the cone, which would quickly absorb, or prevent the liquid running off too freely; *i. e.* before the required degree of vaporization was accomplished.

The evaporating cone, I propose to be made of thin copper, and to be heated in that way which may be found the most convenient and economical; the means depending upon the circumstances of its locality. In the drawing, I have broken away the front of the cone, to shew that it is hollow, and equally adapted to the application of heat to its surface, whether by direct fire, by heated air, or by steam. If by direct fire, a *very* small stove will do, which may be placed on the centre of its circular floor, and immediately over an aperture or tube for the supply of atmospheric air; the flue should descend, or an aperture should be made at the lower part of the side of the cone; in order that the upper part may be constantly preserved at the necessary temperature; the heated air having no tendency to descend and to pass off by the flue, nearly the whole of its caloric, would be usefully applied. If the tube which supplies the air were to pass through the brewhouse furnace, there would probably be no occasion for employing the stove before mentioned, when the furnace was in use, as hot air of sufficient intensity would occupy the upper part of the cone; the heat reqnisite being below that of boiling water. Should steam heat be desired, which is preferable on account of its easy regulation, it might be brought on from the brewhouse copper by similar means to those described, and the condensed portion might run back into the boiler through the same pipe which conveyed the steam. But whatever may be the medium by which the heat is introduced, I submit that its application by this contrivance, is more economical and effective for the purpose of vaporization, than any that has preceded it.

Without presuming to recommend, I would propose that the evaporating cone, should not be heated to a higher temperature than 180° Faht.; to ascertain which, I would have a thermometer fixed in a convenient situation; and I would regulate the temperature by the turning of a cock which would admit a greater or less quantity of steam. At the temperature mentioned but a very small portion of aqueous vapour would be raised along with the spirituous, and by that means I would also separate the spirit, at the commencement of the process, from those matters which usually contaminate spirits of home manufacture. That portion of the wash that escapes

evaporation owing to the low heat, (which would consist chiefly of water and extractive matter), will run off at the bottom of the cone, along a circular gutter, and from thence pass out by an aperture or pipe, as at *e*; while the more spirituous, rises between the inner and outer cone *f f*, enters the neck *g*, and from thence proceeding through the spiral worm shewn in the wash vat *a*,* is received into the recipient *h*, partly in the form of vapour, and partly in the liquid state.

The more volatile portion of the vapour passes onward through the open tube *i*, into the great refrigeratory *k*. This is a large cylindrical vessel or vat, with a strong false bottom at *l*; on this rests a metallic apparatus, consisting of a great number of small tubes *t t* open at each end, and fixed parallel to each other in a vertical position; their lower ends being soldered into a metallic bottom, and passing through it: the upper ends of the tubes, in like manner, are soldered and pass through the concave plate in the chamber *m*. This metallic apparatus being luted or soldered to the false bottom round its lower edge, all the vat above the false bottom *l* is kept filled with cold water by a service pipe inserted at the lower part. The vapour therefore passing through perforations in the false bottom, rises up the numerous small metal tubes, by which it is separated into very narrow columns (into wires of vapour, if the term may be allowed) and being thus exposed in metallic conductors to the powerful influence of the mass of surrounding cold water, its caloric will be very rapidly abstracted; the condensed liquid, which then runs back down the pipes, meets with the rising vapour in its progress, and by that means condenses a further portion at a higher temperature than would otherwise have been accomplished. I mention this circumstance here, to explain the reason, why I allow the vapour to proceed upwards, instead of forcing it downwards, according to the ordinary practice, which alteration I think may be deemed an improvement. By these arrangements I expect that very little vapour will reach the upper chamber *m*, if the temperature of the water is not allowed to get above 80°; but if the supply of cold water should be insufficient for the purpose, the vapour must of course proceed from the tube *n* to another refrigeratory.

It is deserving of notice, that in this apparatus the process may be continued without stopping, as long as the fermented wash is supplied from the brewhouse, which is not the case with any other still. If it be required at any time to have access to the inner cone, a door made on the outer one (which should be kept luted during distillation), will answer this purpose effectually.

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* The passing of the vapour through the vat *a*, has three advantages; the *first*, that of condensing a portion of the spirituous vapour; the *second*, the raising the temperature of the wash to about 160 degrees, so that it is discharged upon the still already in a heated state, and a very slight increase of temperature is sufficient to separate all its alcoholic constituents: the third results from the second; as the temperature will thus be raised to 160° a very strong spirituous vapour will slowly collect in the upper part of the vat *a*, which may be conducted off by the tube *o*, into a separate recipient or refrigeratory, as the spirits thus produced will be of superior purity.

I have proposed to cover the inner cone with cloth of some kind; this might be laid on in longitudinal sections, each piece forming an isosceles triangle, and stretched out to that figure by a stiff wire, which should also be curved to fit the convexity of the cone. These pieces might then be readily taken out at any time, and the deposit washed away, or others put in their places. If these triangular cloths were made of metallic gauze, it is probable the evaporation would be much expedited. It would, however, be desirable to do without these appendages entirely; if the surface of the cone was slightly indented or grooved, the liquid might then be distributed evenly without the cloth, and be detained a sufficient time to complete the operations. There are several obvious modes of treating these points, which it would be tedious to describe, or to read. I shall, therefore, now conclude the subject, as regards distillation, by explaining the meaning of the apparatus attached to the winch *p*. This winch is fixed upon the axis of a small bevilled pinion; this pinion turns a bevilled wheel *q*, which revolves round the upper part of the cone (against friction rollers), and carries with it two long bars *r r*, the edges of which scrape or brush against the surface of the cone, to clear it of sediment or incrustations, which will then fall to the bottom: the bars *r r* are connected by a ring at *s*. Such an apparatus will be useful in the distillation of liquids that contain much extractive matter.

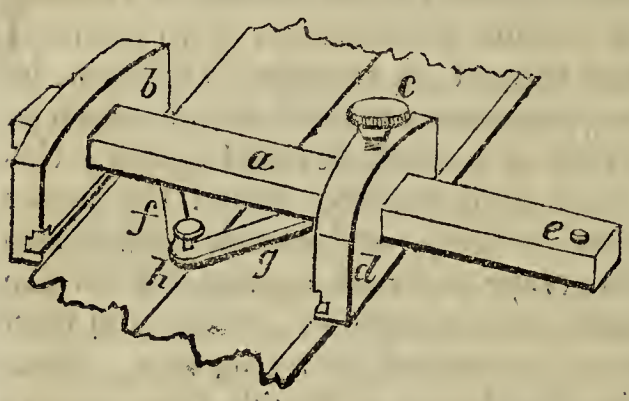
Having concluded my observations upon the apparatus as a still, I proceed to notice its application to other purposes, in which I will endeavour to be very brief.

For evaporation simply, the refrigeratory part of the apparatus is of course to be entirely dispensed with. In evaporating brine for obtaining salt, the double cones appear to me to be infinitely preferable to the immense open pans generally used in Cheshire and other parts. The salt makers proceed upon the improved plan of exposing an extended surface; accordingly, each of their pans measure several hundred superficial feet, and they are filled with the briny liquid to the depth of a foot or more. Now if the principle of extension of surface be right, which appears to be acknowledged by all scientific men, *the greatest extent to which the principle can be carried must have the preference.* Again, it is a most erroneous plan to expose the evaporating surface to the air, which of itself produces a considerable condensation, causing a portion of the vapour to fall down again into the pans, in the state of fine rain. Reason tells us that this must be the case: but the French have done more for us; they *proved,* many years ago, by direct experiment, that evaporation does not proceed so rapidly in uncovered vessels, as in those which are covered, with a pipe to convey off the steam. To complete the apparatus for the preparation of salt, the scrapers *r r*, already described, would be found particularly efficient and convenient.

[*To be concluded in our next.*]

PALMER'S BISECTING GUAGE.

This little contrivance was one of the earliest (among the many useful) inventions of Mr. H. R. Palmer, the civil engineer. It is for the purpose of marking a line along the centre of any parallel or tapering solid, which, from its construction, it is evident, it will do with the greatest accuracy. It answers all the purposes of the common guage, while it is peculiarly serviceable in other respects for which the common guage is wholly inapplicable; in making mortices, and in enabling workmen to measure from a centre line, and to work with greater accuracy and facility, and in many other cases it would be found a very convenient instrument.



The annexed figure is a perspective view of the guage. *a* is a square bar of hard wood, having two sliding cheeks, *b d*, fitted tightly to it. The cheek *b* is fixed fast on one end of the bar, whilst the other slides upon it, but may be made fast at any required place by the thumb-screw, *c*. At the end, *b*, a common scribing point is fixed in the bar, and with this and the sliding piece *d*, it forms the common guage used for drawing parallel lines from the edge of any piece of wood work. The addition made by Mr. Palmer consists of two brass arms, *f* and *g*, of equal length; which are centred in the two sliding cheeks, at *a a*: the other ends are jointed together by the screw, *h*, which is formed into a sharp conical point beneath, to mark the work with.

In using this guage it is evident that the point of the screw, *h*, will always keep in the centre between the two cheeks, *b d*. If the work is not parallel in its width then the screw, *c*, must be loosened, and the two cheeks, *b d*, must be kept pressed towards each other so as to be in contact with the sides of the work; when the point *g* will traverse along the centre of the piece as correctly as if its sides were parallel; because in all situations it preserves an equal distance between the two cheeks, *b d*. These two cheeks have grooves made in them, to receive the brass arms, *f* and *g*, when the cheeks are brought into contact.

NEW GAS-POWER ENGINE,

BY MR. BENJAMIN CHEVERTON, OF KINGSDOWN, NEAR BRISTOL.

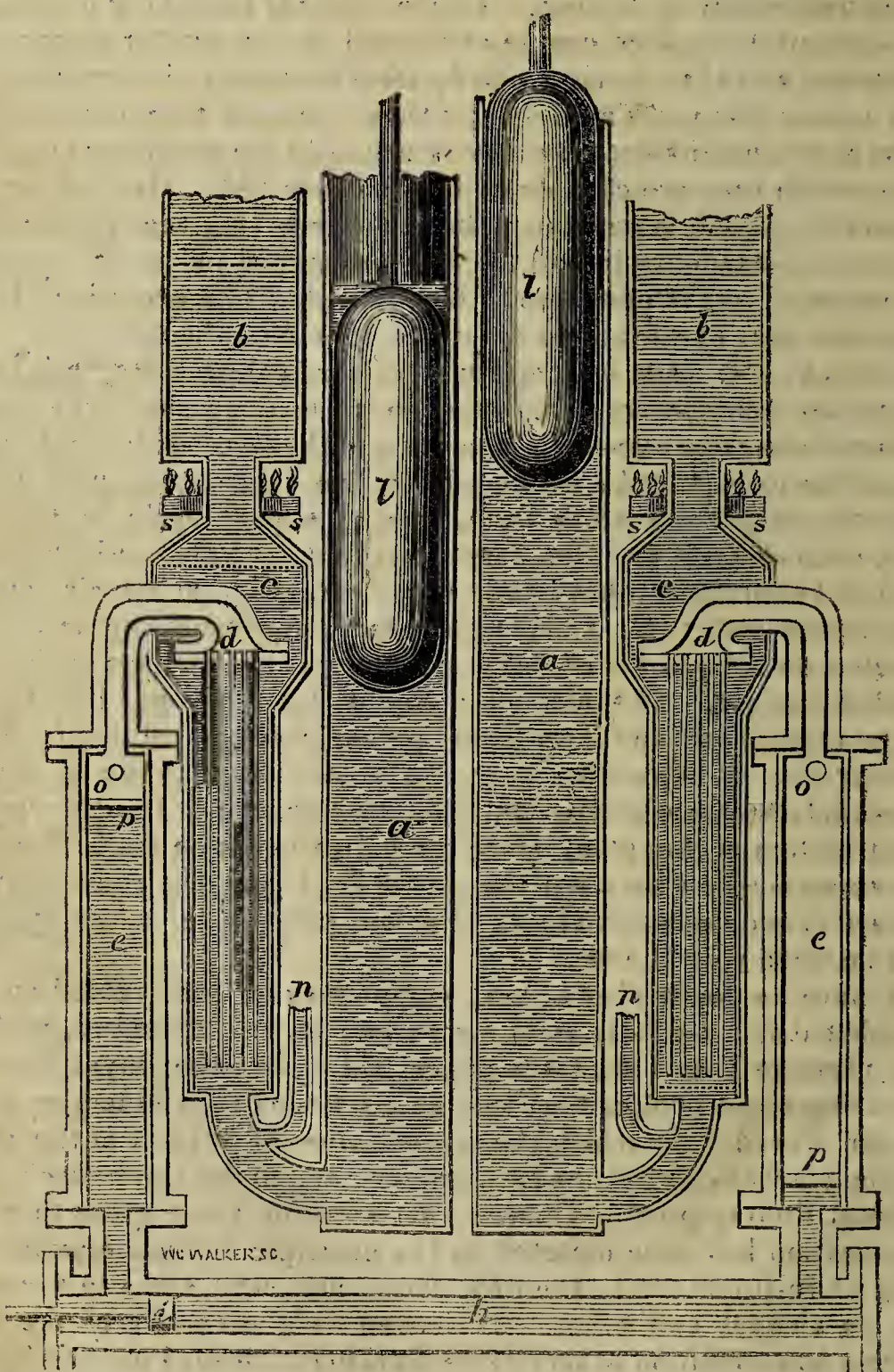
It has long been a desideratum in practical mechanics, to possess a power engine which shall be ready for use at any time, capable of being put in motion without any extra consumption of means, and without a loss of time in its preparation. These qualities would make it applicable in cases where but a small power is wanted, and only occasionally required. They are so numerous, and the consequent saving of human strength would be so great, that the advantages

accruing to society would be immense, if even the current expense were much greater than that of steam. Such an engine should also be actuated by a force so concentrated, and so compendiously appropriated, as to occupy but little space and be but of little weight, by which it would become applicable to locomotive purposes. If, in addition to this, the consumption of materials was moderate, we should then be in possession of a mechanical agent which would enable us to navigate the *ocean* independent of the wind, but which it is in vain to expect from our present means. It is well known that the common steam-engine satisfies none of these conditions. It is true that, on the high-pressure principle, the important requisite of great power in a little compass is obtained, but it is not less true that the saving of fuel is comparatively trifling. I have, indeed, been long of opinion, that little of this effect can be attributed to the greater elasticity of the steam, and that it arises chiefly from accessory circumstances.

I was, a few years ago, led by these views to turn my attention to the gases, having been forcibly struck with the prodigious pressure under which they are capable of being generated. Gunpowder, the fulminating powders generally, but especially that remarkable fluid, azotane, are examples in point. For mechanical purposes, a gradual production of gas is of course to be adopted. The evolution of carbonic acid gas, by the action of sulphuric acid on the carbonates, was an obvious case. On making the necessary calculations, this, with many other means, were found to be too expensive, because the scheme embraced this principle—an *expenditure* of the gas. It became necessary, therefore, to take into consideration those substances which, after assuming the gaseous form, could be fixed again in the fluid state, such as alcohol, ether, turpentine, &c. These, besides boiling at a low temperature, have little specific caloric, and their vapours little latent heat. Dr. Cartwright's much-neglected engine was recollected, but the waste of costly articles was not perhaps sufficiently guarded against. The idea of a liquid body, as oil, intervening between the piston and the vapour, naturally suggested itself. This, however, is not altogether new, for it was acted upon in the old atmospheric steam-engines; but the circumstances of the case require a modification of the plan, since the object is not so much to cut off the communication between the elastic fluid and the condenser, as between it and the external air. For this purpose the whole cylinder must be filled with the oil.

I have no doubt that a good engine may be constructed on this plan, but it did not fully meet my views; it was, therefore, with no little pleasure that I read the paper laid before the Royal Society, containing an account of the experiments made by Sir Humphry Davy and Mr. Faraday, in which the condensation of several of the gases into liquids was effected at a temperature, and under a pressure within practical limits, proving thereby that some of those gases to which my attention had been directed on the principle of their *expenditure*, could be re-produced in the fluid form, and used again in the same way as alcohol and ether. It immediately occurred to me as a *sine qua non* condition of an engine working with *such* materials, that there be no moving joint to which the gas can have access; in short,

that there must not be a possibility of its escape, and that the simplest and most obvious means of satisfying this condition, was to make the same vessel alternately a boiler and a condenser. Further consideration confirmed me in the idea of the practicability of this plan, since the difference of temperature required to produce a great difference in the elastic force of the gas, is but a few degrees, when the minimum elasticity is already considerable. The project of an engine, as represented in the figure prefixed, was therefore substantially completed; it remained only to adopt a mode of alternately heating and cooling the liquid employed. Several plans suggested themselves, but I prefer, for its simplicity, its certainty, and the ease with which it can be regulated, the method which will be immediately explained.



Description of the Engine. The figure presents a vertical section; with this remark, that as all the vessels have a circular form, an horizontal section becomes unnecessary. It is proper to observe, that the disposition of the parts as represented, has been adopted solely for the purpose of bringing the whole into one view. The engine consists of a duplication of parts, viz.—*a a*, two refrigerators, containing cold water. *b b*, calorators, containing hot oil. *c c*, alternators lined with wood, and filled alternately with the hot and cold medium. *d d*, generators, consisting of a cylindrical assemblage of capillary copper tubes, about half filled, at the minimum pressure, with the carbonic acid, or other liquid employed—they communicate with the upper end of *e e*, strong copper gasometers, lined with wood, nearly full of oil, at the minimum elasticity of the gas, but which, at its maximum, expels nearly the whole of it into the cylinder, *h*, in which works *i*, the piston. *l l*, solid wooden plungers. *n n*, pipes for a constant supply of cold water. *o o*, pipes through which gas is in the first instance introduced, and oil occasionally injected, in order to supply the waste at the piston rod—they are closed in a particular manner. *p p*, boards floating on the oil. *s s*, circular cisterns containing oil, each having a circular row of lamps; (- - - - -), level of the water and of the oil; (. . . . .), level of the separation between the water and the oil.

Action of the Engine.—One of the gasometers being nearly full of oil, and the generator attached to it, with the liquid contained therein, being reduced to the lower temperature, the elasticity of the gas is then at its minimum; but which will at all times be very considerable, especially if the carbonic acid, or the nitrous oxide, are the liquids employed; a flood of hot oil suddenly descends upon and surrounds the generator; instantly an evolution of gas takes place, and continues till its density, and consequent elasticity, produces the pressure under which the liquid ceases to boil at the temperature to which it has attained. This increase in the elastic force of the gas will be in some proportion to the elevation of temperature, but differs, not only with the different liquids employed, but with the same liquid, according to the prior pressure under which it was placed. Meanwhile, the gas pressing on the oil in the gasometer, causes it to rush into the cylinder, carrying with it the piston that works therein to the further extremity. The duplication of the apparatus produces the return stroke, and thus an alternate movement is kept up. But to effect the re-action, the elasticity of the gas, which now occupies nearly the whole of the gasometer, must be reduced. For this purpose, the generator is flooded with cold water, which rises from below, bearing up the hot oil on its surface to the place from which it descended. The temperature of the generator and its liquid falls, the gas condenses rapidly on its extensive surface; its density as rapidly diminishes, it returns to its first elasticity, and the oil regains its former level in the gasometer. Again the water sinks, and the hot oil descends, and thus the same vessel becomes alternately a boiler and a condenser; in one case generating a gas, in the other a liquid.

To force up the hot oil from the alternator into the calorator, in

which it is heated, a plunger is immersed in the column of cold water contained in the refrigerator; this raises its level, and consequently the level of the column of water and oil with which it is in equilibrium. There is not the friction, concussion, or elaborate workmanship, which would attend a piston employed for this purpose. The specific gravity of the oil being less than that of water, there will of course be a difference and a varying difference in the altitude of the two columns when in equilibrium, according to well known hydrostatic principles, but this is of no consequence. The plunger must be so proportioned, and immersed so deep, as to displace a body of water equal in volume to that of the oil elevated, besides what is required for the raising of its own level. Now it is obvious that here is an opportunity to regulate the power of the engine, for the less the plunger is raised the less is the descent of the hot oil, and consequently less of the liquid is exposed to its influence; a governor, therefore, would be very properly applied to the movements of the plungers. If a greater power is required than when the governor is at the extreme limit of its influence, that is, when the generator is entirely surrounded with hot oil, it may be produced by bringing the lamps nearer to the calorator, or by lighting a greater number of them. If, however, the same velocity of action is not required to be maintained, the engine, possessing in itself a source of self-regulation, will increase in energy for the occasion; because the slowness of the strokes, allowing a longer time for the heating of the liquid, its temperature will be raised to more than the ordinary degree, for this must be always less than that of the hot oil. The extent to which this enlargement of the power may be carried, and the facility with which it may be effected, is of great importance with respect to navigation, and will be duly appreciated by those conversant with the subject. The limits of this extension, and the safety of the engine, are points which will be discussed hereafter. It should be observed, that the action of the plungers must be a little in advance of that of the piston, in order to give time for the heating and cooling of the *metal* of the generator.

Remarks.—There is this peculiarity in the engine, that it has neither valves, cocks, nor pumps, nor any moving joint, except that of the piston and its rod; hence its simplicity, and consequently the cheapness with which it may be constructed. The room which an eighty-horse power engine would occupy, would not probably be more than a cubical space of seven feet dimensions, so far as the cylinder and its appendages are concerned. It would be quite practicable to attach a guage to the engine, by which the pressure of the gas may be ascertained; and means are devised by which the height of the liquid in the generator may be known. The introduction of the carbonic acid, or other liquid employed, should be in the form of gas. For this purpose, the generator must be brought to a lower temperature than the gasometer, which will occasion the greater part to condense therein; that which may form in the gasometer will distil over, after the apparatus for producing the gas is removed. It is also for this reason, that there is no fear an accumulation of the liquid

will take place in that vessel during the working of the engine. To prevent condensation, however, in any hurtful degree, its interior is lined with wood, and a board floats on the surface of the oil. Another plan would be, to maintain the gasometer at the higher temperature to which the liquid is raised; but this is by no means advisable if it can be avoided. The board is also of important use, in preventing the absorption of gas by the oil, during the greater pressure; which being evolved at the time of the collapse, would prove injurious, by diminishing the difference between the elastic forces. Oil is selected as the heating medium, because it is lighter than water, and has its boiling point so much higher. It is probable, however, that 212° is a temperature sufficiently superior to that to which the liquid will require to be raised, and such as will produce its almost instantaneous heating; if so, hot and cold water may be employed. From the relative position of the two mediums, little communication of heat can take place. The alternator is internally lined with wood, partly to prevent a loss of heat, but principally to preserve, as much as possible, the coldness of the water. In a loco-motive engine, the water could only be occasionally changed; in the intervals, a cooling process may be at work, and the plungers would perform the office of a pump.

London Mechanics' Institution,

WEDNESDAY, 19th of APRIL, 1826.

MR. WALLIS'S THIRD LECTURE ON ASTRONOMY.

THEORY OF UNIVERSAL GRAVITATION—THIS PRINCIPLE APPLIED TO THE LUNAR MOTIONS—TELESCOPIC APPEARANCES OF THE MOON—PROOF OF HER BEING SURROUNDED BY AN ATMOSPHERE—GENERAL THEORY OF THE TIDES.

On Wednesday evening Mr. Wallis delivered his Third Lecture on Astronomy. He commenced by observing, he should endeavour to lead them into the more abstruse parts of this science: for science must become abstruse as they made progress in it. They must proceed on hypothesis. They must endeavour to account for the phenomena of the heavenly bodies by referring to that with which they were familiar on their own planet; by selecting some one principle, the application of which would account for the nature of works of the greatest magnitude. He had already referred to the weight of bodies; he was here speaking of a certain effect. He would proceed to describe the cause of that effect; and further than this natural philosophy could not extend. With any knowledge of *efficient causation*, or why a thing acted as it did, they had nothing to do. When he said a body fell to the ground, he only described in simple words a thing evident to the eye: but, when he said such body was attracted by the earth, he endeavoured, scientifically, to account for its falling. Thus, they were ignorant of the nature of that cause called gravity; but observation induced the belief that there was a cause, and this term was given to it. Gravity was supposed to be a principle attached to bodies. The law of gravity was this—it decreased inversely as the square of the distance. In the establishment of these hypotheses, if a single fact were found to contradict them they were unworthy of attention: but nothing has hitherto occurred to contradict this law of gravity as laid down by Newton. The moon has a tendency to fall to the earth: and falling bodies have an accelerated motion.

In his First Lecture he had treated on dynamics, and there laid down that inert bodies, if at rest, would have a tendency to continue so, and if in motion

to continue their motion, if they were not operated upon by any resisting medium. Thus, a cannon-ball would, were it not for the atmosphere, continue to move on for ever in the way projected, and with the same velocity. This was reasoning according to dynamics; but in mechanics there were friction and weight to be overcome. The weight of a body was caused by the attraction of the earth, and its velocity increased during its fall. It had been ascertained, that all kinds of matter moved with an equal velocity if placed in a vacuum or void space. On this principle, if a guinea and a feather—the former 1000 times the weight of the latter, were placed in vacuum, the guinea, from possessing 1000 times the number of particles contained in the feather, would be attracted by the earth with 1000 times more power.

The worthy Lecturer then observed, that he derived great satisfaction from the consciousness that he was addressing, if not a scientific audience, one wishing at least to become so. He proceeded to explain that the spaces passed over by falling bodies increase as the squares of the time occupied during its fall. On this principle, if a body passes through 16 feet in the first second of its falling, to find out the distance through which it will fall in 3 seconds, the amount of seconds is squared, and the space through which it fell in the first second multiplied by the product.

The worthy Lecturer then proceeded to describe, that the square of the time in which a body revolved, bore a constant proportion to the cube of the distance, illustrating it by means of diagrams. There was a cause in the earth which acted upon the moon, and its orbit resulted from a combination of two forces, the one a projectile force, and the other a centrifugal force. With the nature of these causes, he before said, they had nothing to do, they might describe it in any way, as they did the power of steam or gunpowder, but that was all science ever pretended to. The worthy Lecturer, after explaining some of his excellent diagrams with considerable perspicuity, observed, that he did so from a desire to send them away at least incipient astronomers; he thought the science of astronomy was quite in accordance with the nature of Mechanics' Institutions, one of the great objects of which was to employ them at a leisure time, when they were assailed by ten thousand temptations. The principle of gravitation was applicable also to the tides; this was a subject which had been found to be attended with considerable difficulty, but was corroborated by facts. The worthy Lecturer said he should then proceed to exhibit to them some of the general phenomena of the moon, as described on its surface, and for this purpose he should introduce to them an exquisite delineation of the lunar surface, by Russell, which was the most correct published. He had said there was only one hemisphere of the moon ever presented to us; Mr. Russell, therefore, was obliged to content himself with a delineation of one half only. As, however, the moon moved in an ecliptical orbit, in consequence of its libration, Mr. Russell had been able to describe rather more than one half; owing to the small size of the globe, it could not be submitted to public inspection; but Mr. Wallis said he should show them a transparency, in which the delineation was on a more extended scale.

Astronomers had been inquisitive as to the atmosphere of the moon; that it possessed one, however, there could be little doubt. This fact was detected during the occultation of Jupiter in the year 1824, when the moon passed between that planet and the earth. This was elucidated by a transparency, which showed, that when the moon's dark limb was passing over that planet, the latter became distorted in its appearance, and seemed to overlap the moon; and it was inferred, that this could only be occasioned by the refraction of the moon's atmosphere. The same phenomena were observable with the satellites of Jupiter, and during the occultations of *Georgium Sidus*.

This brought the moon under another analogy to our planet. There were great cavities in the moon; he called them great, considering she was only a fiftieth part the bulk of our earth. If her surface were not thus broken up, instead of giving a mild light it would be most intensely brilliant; when at the full, its light would be more than the eye could bear.

The Lecturer then exhibited a beautiful transparency of the moon at its

full; and pointed out the dark parts which were supposed to be water: for it was known that water assumed a dark appearance when light fell upon it perpendicularly, but when obliquely it was brilliant. The dark parts then were considered either seas, rivers, or lakes, or forests of trees.

Another transparency of the moon was exhibited, and from the outward edge of the part not illuminated being irregular and ragged, it was inferred that there were mountains and excavations on which the light was shining obliquely. In support of this hypothesis it was observed, that the shadows were all on one side. They were observed too, to change position, sometimes being apparent on the eastern and sometimes on the western sides: there could be no doubt, therefore, that these appearances are occasioned by projections. Mr. Wallis also observed, that there was a thin straight line extending to a considerable extent, which had been jocularly called a canal. Amongst other phenomena, there were some circular spots to which we know of nothing at all analagous. The moon, however, was supposed to be much under the influence of volcanic action, and it was thought these spots might be great chasms of volcanic mountains which had exhausted themselves. They appeared of an oval nature from their being foreshortened.

Mr. Wallis then recurred to the phenomena of the tides. If the earth attracted the moon, the moon had also its attractive influence on the earth. This influence extended all over the earth, but its effect was, in course, greatest on that part of the surface which was nearest. Now the moon passed round the earth in about 27 days and a third; but the earth revolved on its own axis towards the moon in 25 hours, and there were two tides in the course of that period. These two tides were in the opposite hemispheres, and at the same time. The way in which they endeavoured to account for two tides in contrary hemispheres was, by referring that nearest the moon to her attractive influence on the water, and the other to the earth's centrifugal force, and its being attracted, which would cause the water to rise in the opposite hemisphere. It must be evident that the same effect would be produced by the earth being attracted from the water, as by the water being attracted from the earth, and it was in this way they accounted for the water rising in opposite hemispheres at precisely the same time.

He did not mean to exclude the solar influence, but that he should reserve for the next lecture. The sun's aggregate attraction was greater than the moon's, but its immediate, partial influence was less, in consequence of the greater proximity of the latter. With this fact he should conclude his present lecture, and in the next he proposed laying before them Universal Gravity, and showing its application to the phenomena of the tides. Mr. Wallis retired, followed by the grateful plaudits of the members. The transparencies exhibited during the evening were of a most beautiful description, and by far too numerous to describe in a condensed report.

After the lecture Dr. Gilchrist announced, that the French classes would be opened at 8 o'clock in the evening of the 3rd of May, and that all who had made application would be admitted, if they attended at that time.

Discoveries & Processes in the Useful Arts.

Painting in Milk.—The composition employed for this purpose is composed of 2 pints of skimmed milk, 8 oz. of slaked lime, 6 oz. of linseed oil, 5 lbs. of Spanish white, and 2 oz. of Burgundy pitch. The pitch having been slowly melted in the oil at a low temperature, after which the milk and lime, previously heated, are to be added to the former.

The following substitute for the above preparation is also found to answer well. Take 114 parts of very dry powdered cheese, 7 parts

of slaked lime, 240 of Spanish white, and 2 parts of fine charcoal in powder, with 80 parts by weight of water.

Transmission of Sound.—The last number of the Revue Encyclopédique contains an account of a very extraordinary proposition, viz. to communicate verbal intelligence in a few moments to vast distances, and this not by symbols as in the telegraph, but in distinct articulate sounds uttered by the human voice. This plan originated with an Englishman, Mr. Dick, according to whose experiments the human voice may be made intelligible at the distance of 25 or 30 miles. The experiments of the celebrated Biot have ascertained that sound travels ten times quicker when transmitted by solid bodies, or through tubes, than when it passes through the open air; at the distance of more than half a mile the low voice of a man was distinctly heard.

At the latter end of the last century, a clergyman, named Gautier, conceived a plan of transmitting articulate sounds to immense distances; he proposed the construction of horizontal tunnels, that should widen at the extremities, by means of which the ticking of a watch might be heard more distinctly at the distance of 2000 feet than when placed close to the ear; he calculated that a succession of such tunnels would transmit a verbal message 900 miles in an hour.

Recipe for Driving Insects from Trees.—Bore a hole into the trunk of the tree, as far as, or into, the heart, fill this hole with sulphur, and place in it a well fitted plug. A tree of from four to eight inches diameter requires a hole large enough to admit the little finger, and in the same proportion for other, and larger, or smaller trees. This will usually drive the insects away in the course of 48 hours; but uniformly succeeds, perhaps sometimes after a longer period. These facts were mentioned to me by the Rev. Dr. Woodhull. He stated that a fine large shade tree, in Albany, was so infested with worms and caterpillars, that passers-by were obliged to make a circuit to avoid it; it became so much of a nuisance that they were on the point of cutting it down, when the application of the experiment in 48 hours completely cleared it of the insects. Col. Rutgers, of New York, has tried this experiment with (I think) uniform success; and, in several instances, fruit-trees which were almost lifeless, were restored.—*B. D. S. American Journal.*

French Process of Making Bistre.—This colour is made from those pieces of wood-soot which are the hardest, and adhere most firmly to the chimney. These are to be reduced to powder in a mortar, and passed through a fine sieve; this powder is next to be well washed in water, by frequently stirring it up, and then allowing it to settle, by which the salts contained in the soot will be dissolved and washed away. This process may be expedited, by using hot water, which will take up and hold a greater quantity of salt in solution. But if any saline taste remains after decanting the first water, and adding fresh, the process should be repeated until the water is tasteless, or of the same specific gravity as the pure water employed. The sediment is then to be put into a tall narrow vessel, and agitated with fresh water; it is next allowed to rest for two or three minutes,

when the coarsest of the powder will subside, and the finest portion suspended in the liquid is then to be decanted into another vessel. The coarse sediment may then be thrown away as useless, and the finer obtained by allowing the liquid to rest a sufficient time for the whole to subside. This last is the bistre, which being incorporated with gum water, forms that very useful water-colour pigment.

If it be required to have it particularly fine, the washing and decanting may be repeated, separating the coarsest portion, as before, which of course always separates the earliest.

Etching and Cleaning of Alabaster.—Mr. Henry Moore, of Green Hill, near Derby, has lately received an honorary medal from the Society of Arts for the communication of a process, by which alabaster (called also gypsum, and sulphate of lime), may be etched, so as to resemble sculpture; and another process, by which alabaster ornaments may be perfectly and easily cleaned, so as to appear fresh from the chisel of the artist.

Taking advantage of the well known fact, that sulphate of lime (alabaster) is perfectly soluble in 500 parts of cold water, Mr. Moore has adopted the following process. He covers the ornament, and all those parts that are not to be corroded, with a composition that will resist water. Wax dissolved in spirits of turpentine, and mixed with white lead, may be used with a camel hair pencil, or turpentine varnish, with a little animal oil and white lead, and will be found to work more freely than the wax. Spirits of turpentine must be used in pencilling with those compositions. The use of animal oil is to prevent the varnish from becoming very hard, which would render its removal, after corrosion, very difficult. The ornaments, and other parts that are intended to be preserved, being completely covered with the composition, it is suffered to remain a few hours to dry. The article is then put into a vessel of rain water, in which it must remain 48 hours or longer, according as the ornament may be required to have more or less relief. When the corrosion is completed, the varnish or wax must be removed with spirits of turpentine, which may be applied with a bit of sponge, and then be wiped off with soft wax.

The article being made quite clean, is now rubbed over with a soft brush, dipped into finely powdered plaster of Paris, and is applied in the dry state. This powder fills the pores of the corroded parts, giving a certain degree of opacity, similar to that which is left from the tools of the sculptor. It forms a good ground, that contrasts well with the ornament, and makes it appear with greater advantage than if left merely in the corroded state.

To clean Alabaster Sculptures.—Spots of grease are first to be removed with spirits of turpentine; the article is then immersed in water, where it is suffered to remain about ten minutes, or perhaps a little longer, if the thing be very dirty: it is then rubbed over with a painter's brush, suffered to dry, and then treated with plaster of Paris as before mentioned, when the article will be found perfectly clean, as if just from the hands of the sculptor. A piece of sculp-

ture that would take several days to clean in the usual way, with fish skins and Dutch rushes, is by this process completed in half an hour.

New Glazing for Earthen-Ware.—A manufacturer of earthen-ware at Berlin, M. Rochinski, has lately discovered a glazing for common ware, that is perfectly innoxious in its use, as has been proved by repeated experiments before the College of Medicine. It is composed of five parts of litharge, two of purified clay, and one of sulphur. These substances being reduced to powder, are mixed with a solution of caustic alkali, the same as used by the soap makers. In this state it is spread over the surfaces of the pottery, which, after being carefully baked, give no traces of lead.—*Bulletin de la Societé d'Encouragement.*

Voyages of Discovery.—The expedition under Capt. Durville, the ships for which have been for some time fitting at Toulon, are now nearly equipped and will shortly proceed to sea.

Flying Fish in the Channel.—In the last number of the Quarterly a correspondent writes, "In going down the Channel, on the 23rd August last with light winds from the E. N. E. inclinable to calm, when off Portland, we were surprized with the appearance of rather a large shoal of what is commonly called the *flying fish*. They were evidently closely pursued by some one of their numerous enemies from the frequent and long flights which they took; but it was impossible to discover what he was, though passing close to the vessel."

TO OUR READERS AND CORRESPONDENTS.

We understand that a preliminary meeting for the formation of a Mechanics' Institution, in Southwark, will be held at the Globe, York Street, Borough Market, on Monday next, at 7 o'Clock in the evening, when the attendance of those persons, who are favourable to the object of the meeting, is particularly requested.

The Third Volume of this work will be published with our 72d number; it will be accompanied by a fine Steel Plate Engraving, representing a perspective View of the London Mechanics' Institution, from the Garden of Staples Inn.

In reply to J. B. we hope shortly to have the means of giving a full description of Dr. Alban's ingenious Steam Engine.

Nauticus is informed that a description of Capt. Phillips's patent improved mariner's compass was prepared for this week's number; but is postponed, for want of room, until our next; in which number we hope also to "gratify" our friend Aquarius, with an account of the new water engine he is so "anxious" to see.

J. B—h has a bad memory—but we are satisfied with his good intentions. His second letter we never received; perhaps he forgot to send it. We thank J. S—e for the pamphlet, which we shall have much pleasure in perusing—but we fear the subject is too foreign to have place in our work.

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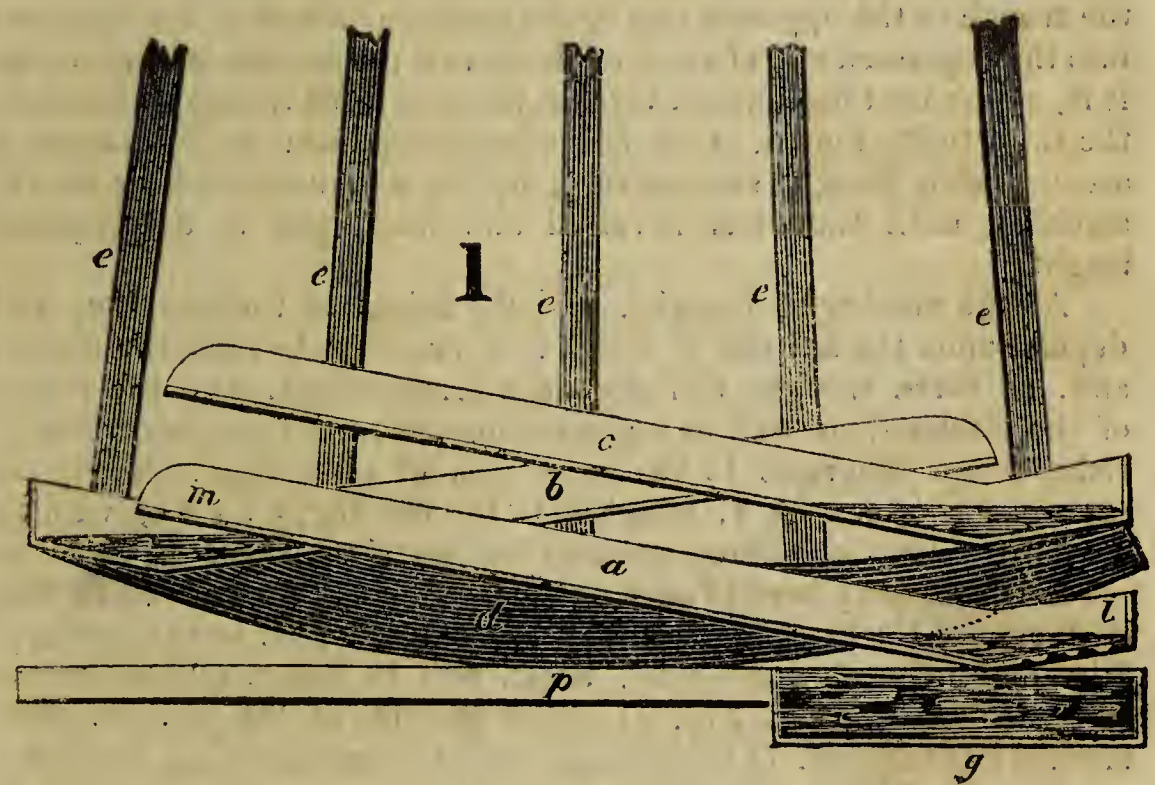
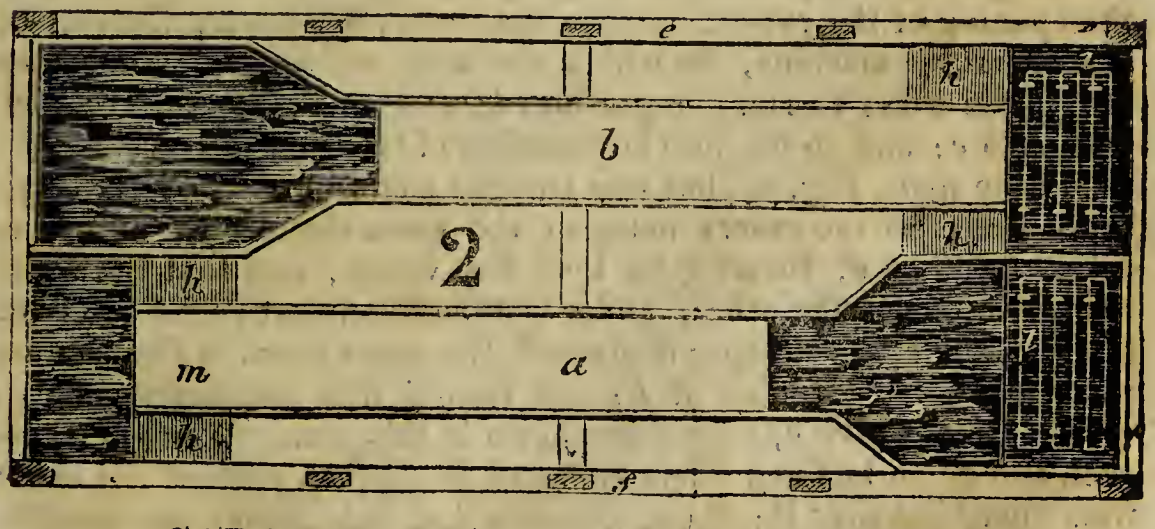
CONTENTS:

Cabanal's New Patent Water Engine.... 338
Apparatus for the Concentration of Saline Liquids, the Generation of Steam, the Manufacture of Vinegar and Verdigris 339
Luckcock's Patent Process in Manufacturing Iron 340
Mr. Perkins's Improved Mode of Warming and Ventilating Large Buildings 341
Captain Phillips's Patent Ship's Compass 344
Parker's Patent Paved Roads. 345
Bagshaw's Patent Earthen Pipes 346
History of the Steam Engine, Chap. II (continued) 347
Mechanics' Institution, Southwark 349
London Mechanics' Institution, Mr. Wallis's Fourth Lecture on Astronomy .... ib.





CABANAL'S NEW WATER-ENGINE.

CABANAL'S NEW PATENT WATER ENGINE.

This very singular and apparently effective machine for raising water is the invention of Mr. Rudolph Cabanal, Engineer, of Melina Place, Westminster Road. It consists of a series of troughs, fixed one above another in a frame work, and so inclined in contrary directions, that each trough is united at one of its ends with the trough next below it; and, at the other end, with the trough next above it. The lower part of this frame-work forms the segment of a circle, and rests upon a horizontal plane; so that with a very slight impulse the whole machine is put into a rocking motion: the lowest trough is thereby made to dip, at each oscillation, into a reservoir of water, which enters the trough through valves at the bottom; these opening only upwards; the water cannot return. As the next oscillation raises the end that was before depressed, the water runs along the trough to the opposite side of the machine, where it is discharged into the depressed end of the trough above it; from this second trough it is, at the next oscillation, thrown into the third trough; then from the third to the fourth, at the following oscillation: in like manner it ascends each trough, successively, by the alternate rocking of the machine, until the water is raised and discharged at the required height.

As the number of troughs, and the height of the machine, will depend upon the altitude to which it is required to raise the water; and, as three troughs will shew the arrangement, and the action of the machine, as well as a greater number, we have, accordingly, reduced our diagrams to the exhibition of only three. These are shewn at *a*, *b*, *c*, *Fig.* 1, attached to the framing, *e e e e e*, with its curved segment, *d*, resting upon its horizontal plane, *p*.

It is necessary here to notice that the frame-work is double; that is, there are the same parts on this side the troughs, as are shewn in *Fig.* 1, on the opposite side; which will be better understood on reference to the *plan*, *Fig.* 2; where one side of the parallelogram, marked *e* (as in *Fig.* 1) corresponds with the opposite side, marked *f*.

Now it will be evident, that when the lowest end, marked *l*, of the trough, *a*, is depressed, it will dip into the reservoir, *g*, and, by the opening of the valves, receive the water, as shewn; the reverse motion of the machine, by which the end, *m*, is depressed, then causes the water to run along *a* into *b*, and, at the next oscillation, from *b* to *c*; and so on, into any number of troughs, in succession.

In the plan, *Fig.* 2, but two troughs could be shewn; these are the lowest; all the others being of the same shape. *l l* is the depressed end of *a*, shewing its long flap valves, and that the water runs from one to the other, under the partition that seems to divide them. The end, *m*, being depressed, the water flows in like manner into the double chamber of *b*; and from *b* it is discharged into *c*; which, being above *b*, cannot be shewn in this plan. To the ends of each trough an inclined plane or board is fixed to prevent the water from splashing over it; these are shewn at *h h*, under the troughs, *a* and *b*.

APPARATUS FOR THE CONCENTRATION OF SALINE LIQUIDS, THE GENERATION OF STEAM, THE MANUFACTURE OF VINEGAR AND VERDIGRIS.

Continued from p. 325, of No. 69, which also contains the elucidatory engravings.

In the concentration of vegetable solutions generally, but in particular that of sugar, my evaporating cones appear to me to have a decided preference over the open pans, commonly used in the West Indies and elsewhere. In the successive evaporations which the syrup undergoes, previous to the crystallizing process, the liquid is ladled from one vessel to another: in my apparatus this trouble is entirely dispensed with, the liquid continually running off, of itself. In the consumption of fuel, I conceive, there would be a considerable saving, as the caloric is applied with greater effect, and more economically, than by the usual furnaces; and the condensation of the vapour back into the syrup is prevented, by my external cone or covering, which excludes the evaporating surfaces from the air. My scrapers would also be applied very effectually in removing any incrustations that might form on the surface of the inner cone. The cones might be made of any magnitude, or several might be arranged a little above one another.

For the generation of steam for motive engines, I see no difficulty in its application; for that purpose, the rapid and economical production of vapour in strong vessels appears to me all that is required. I need not repeat that my extended surface and mode of applying heat would produce vapour with great rapidity; and it is obvious that the conical form offers great strength. For low-pressure steam, a very thin internal cone would do; and for high pressure, a very thick one would not be necessary; as the expansive force would be exerted in that direction where the vessel was strongest: the exterior cone should however be of greater strength than the interior one, yet of a less substance than boilers in ordinary use; and it would be attended with this further advantage, that in case of the exterior cone bursting, very little damage would result; there would be no hot water to scald, nor any masonry to be blown up, or building destroyed in consequence.

In the preparation of Vinegar, it is a commonly received opinion, and I presume a correct one, that the acid property of the liquid is derived by its absorption of oxygen; the operation usually consists in exposing the liquid under fermentation, in open vessels, (or imperfectly closed) to the atmosphere. Now it has been found, that the oftener the surfaces of the liquid are changed, by agitation, or by ladling or pumping it out of one vessel into another, the sooner the vinegar is formed. The acidifying principle being thus obtained, it appears to me to follow, that that apparatus must be the best for the purpose, by which the most extended surface of liquid can be conveniently exposed to the influence of the atmosphere; accordingly I venture to propose my cones before described, for this purpose also, but under certain modifications. First I would have made a series of cones (of the cheapest materials) and of such relative dimensions, that they may be enclosed concentrically one within another,

a few inches apart: the liquid in the thinnest possible strata, might then be allowed to flow over them, by similar means to that described in the first part of my letter. The effect of this arrangement would I think be a very rapid absorption of oxygen, or in other words, the speedy forming of the vinegar. By the plan described, I have supposed the cones to be open at top and bottom, for the air to circulate between them. It might *possibly* be an improvement to let all these cones terminate or open into one common tube; the air in which tube might be exhausted by any convenient means so as to increase the draft. An obvious and an inexpensive mode of producing this effect would be to supply the furnace with air for the combustion, from this tube, by which means a rapid current of air between the cones would be promoted. In vinegar manufactories a large furnace is almost always employed, whether in distilling the acid from wood, or in making a solution of malt.

Verdigris, as is well known, is a combination of the acetic acid with the oxide of copper: it is usually prepared by frequently wetting the surfaces of copper plates with vinegar, by various media, and when the copper becomes sufficiently coated with the green oxide, it is scraped off, and put into bags for sale. This operation is usually performed by removing the copper plates, (which are about 12 inches square) from the racks in which they are laid, and the plates are one by one scraped with an instrument made for the purpose. The copper plates used are generally very light, weighing about 16 ounces to the superficial foot; I would use copper of much greater thickness, in constructing my cones, and place several of them concentrically one within the other; each of the cones should be provided with a pair of scrapers, and the bevilled wheel and pinion beforementioned, so that I might act upon them all by the turning round of one spindle; thus the Verdigris, covering several very extended surfaces, might be scraped off *in a few seconds*. The cones would last a considerable time, as the metallic portion of Verdigris is but a small component part of it.

I shall here conclude my letter, fearing to exhaust the patience of your readers, and to occupy too large a space in your columns. If in the preceding observations I had explained my views with more brevity, I should have troubled you with some additional remarks on the application of my proposed apparatus to other useful purposes.

16*th April*, 1826. Your constant Reader, L. H.

LUCKCOCK's PATENT Process in MANUFACTURING IRON.

In the conversion of British cast or pig-iron into wrought iron, the metal is thrown in what is called a "puddling furnace" where as soon as the metal begins to melt, and assume a frosty appearance, the "puddler" throws in a small quantity of water from time to time, and employs himself in stirring and raking it about; the metal is thus prevented from acquiring too high a temperature, while the carbon is assisted in making its escape. By this process the iron acquires a malleable or ductile quality, which enables it to be taken out of the furnace in lumps and to be drawn into bars either by the

blows of a tilt hammer, or by compression between grooved cylindrical rollers. This iron is however the "common," in other words, of an indifferent quality. To improve the quality, it undergoes one or more repetitions of the last process; it is cut into short lengths, made up into faggots, heated and rolled, or hammered out again into long bars.

Now the specification of the patentee (Mr. Joseph Luckcock, of Round Cottage, Edgebaston, near Birmingham), states, that he has discovered a simple chemical means, of improving the quality of the common iron, whilst in the puddling furnace; by which we presume it is to be understood, that he avoids the necessity of repeating the subsequent operations just mentioned; and by that means he can enable the manufacturer to render a superior iron, at a much lower price, than when prepared by the ordinary process.

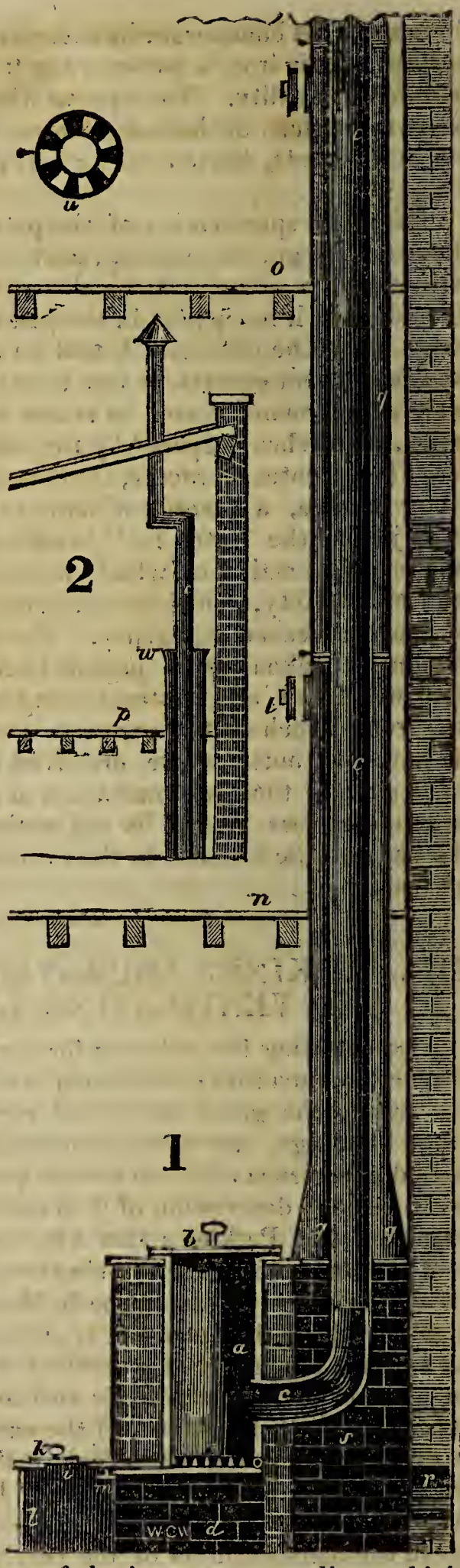
The patentee's process, consists in adding to the iron in the puddling furnace, a quantity of muriate of soda, (the common culinary salt) just as the metal is "breaking down" into a state of fusion; the chemical action of which upon the iron causes that toughness and malleability, which has hitherto been effected by laborious and expensive mechanical agency. The proportion of salt recommended, is generally about seven pounds to $3\frac{1}{2}$ cwt. of iron; but this proportion will admit of variations being made according to the quality of the iron, which a little experience would determine. Such furnaces as have iron bottoms are preferred by the Patentee, to those which have only for their bottoms a bed of sand, as the effect of the process is rendered less certain by the action of the salt upon the latter. To us, metallic bottoms to the furnaces, appear to be almost indispensable.

MR. PERKINS'S IMPROVED MODE OF WARMING AND VENTILATING LARGE BUILDINGS.

In selecting the subjects for our work we usually give the preference to novelties; but when we have omitted all notice of an invention, the great utility and superiority of which for warming large buildings, has been demonstrated by repeated trials, and the actual experience of three or four years, we feel it incumbent upon us to insert a description of it in our work. Such are the undisputed merits of Mr. Perkins's Hot Air Stove, which we have had almost daily opportunities of witnessing for a long time past, on the premises of our Printers, Messrs. Coe & Moore, at No. 27, Old Change, St. Paul's; where the invention is applied on an extensive scale, and in so efficient a manner, as to excite the admiration of all strangers. It is of importance to the public also to know that Mr. Perkins has not availed himself, by patent, of the exclusive privilege of making these stoves; nor does he, we believe, make them at all; so that any body is at liberty to construct them. It is, however, due to Messrs. Walker, of St. John's Square, Clerkenwell, to mention, that they were the manufacturers of the very complete apparatus above mentioned, which we shall now describe, with reference to the annexed engraving.

Figure 1 is intended to represent a vertical section of the stove, flue, &c. as well as of Mess. Coe & Moore's Printing-Offices, were it is fixed. *Fig.* 2 is a continuation of *Fig.* 1, (on a smaller scale) extending it above the roof of the building: the letters of reference designate similar parts in each of the *figs.*

The stove, *a*, is of a cylindrical form, fixed vertically in the brick-work; it is closed above by the lid, *b*, which is removed as often as may be required to supply the stove with fuel; coke is preferred for this purpose, a very small quantity of which produces a great effect; (there never need be so much of it as to fill up the space between the grating on which it is thrown, and the side opening into the flue): *c c c* is the flue, which is a tube of wrought iron, excepting that curved portion immediately connected to the furnace cylinder, which is of cast-iron; *d* is the ash pit. At *i* is an elliptical aperture for the supply of air to the fire, which may be admitted in a greater or smaller volume, by removing the oval cover, *k*, wholly or partially: *l* is a furnace door, for affording convenient means of clearing out the ashes. The grating, on which the fuel lies, is not fixed immoveably in the brick-work, as usual, but is connected to the frame by hinges on one side, and held up on the other by a cross bar which rests on an iron button, *m*; this button being turned one quarter round, the grating immediately falls (as a trap door) letting out all the fuel, by which the fire is almost instantly extinguished, without trouble.

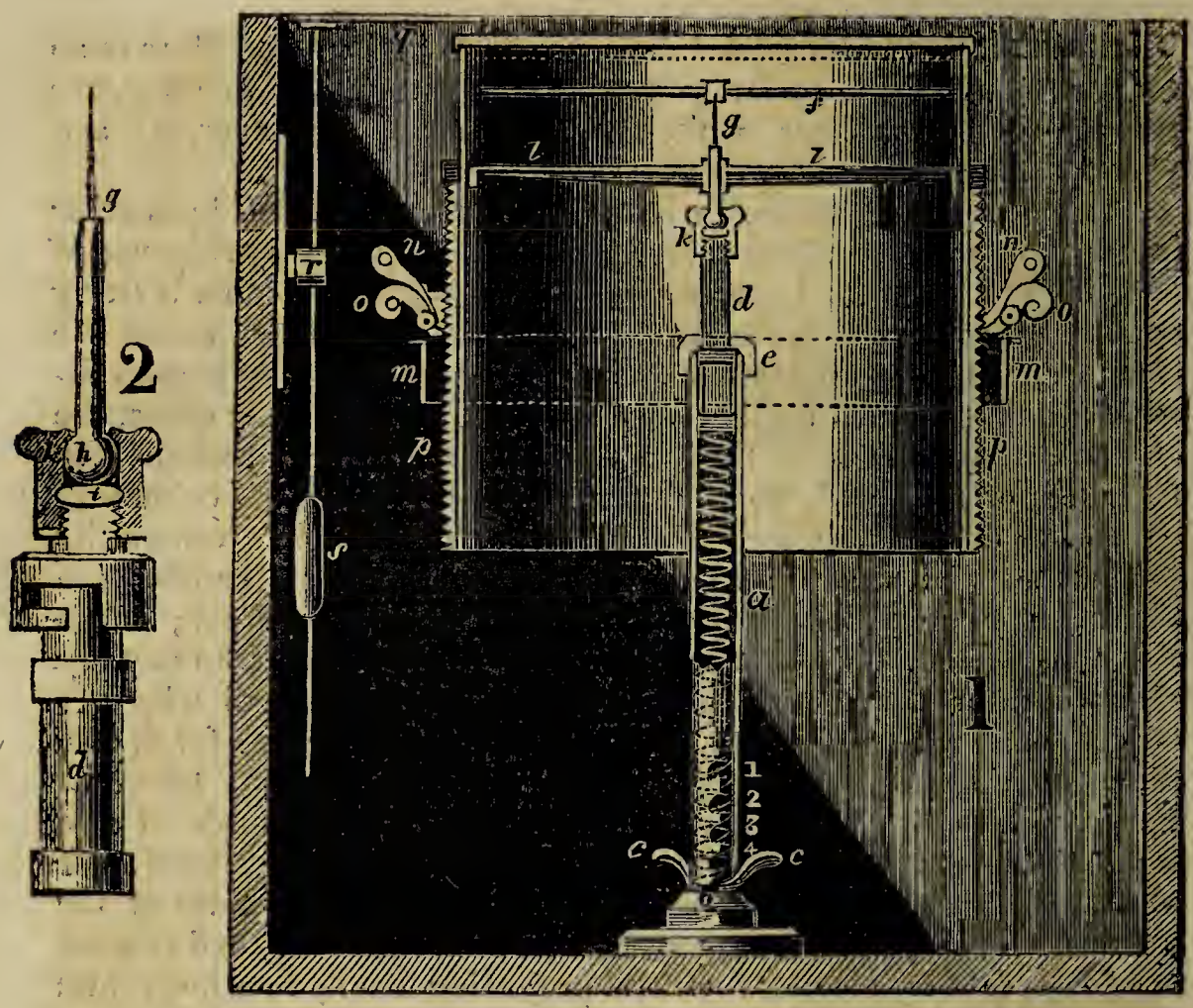


The stove is placed on the floor of the basement or cellar, which

it keeps thoroughly warm and dry, so as to make it a good store room for paper, although under ground; from thence the flue ascends through the ground floor, *n*, the first floor, *o*, the next floor, *p*, and passes through the roof, as shewn.

The flue for the smoke, *c c c*, is surrounded, as shewn, by another larger tube, *q q q*, at about three inches apart, for the conveyance of heated air to the several apartments. To effect this, cold air is freely admitted through a large aperture, *r*, in the wall, which enters the chamber, *s*, and impinging upon a strongly-heated surface it immediately acquires a much higher temperature: to increase this effect, the curved cast-iron neck of the flue adjoining the stove is considerably flattened, or expanded, so as to oppose to the ascending column of air a more extended surface of hot metal. The caloric given out by the burning fuel, instead of being chiefly carried off by the flue as in the ordinary stoves, is rapidly abstracted by the current of air; which air, thus heated, may be wholly or partially given out into any one apartment, or distributed in the several apartments, in whatever degree, or in various degrees, as it may be required (either for drying the printed sheets, or for warming the persons at work,) by a few simple valves or "registers." These registers are made of two separate annular plates, sliding circularly on their flat surfaces, one over the other; the lower one is fixed by rivets to the sides of the external air tube, and the upper one lies upon the lower, and is made to slide over it by moving the little projecting handle in a horizontal direction, to the right or left, a slot mortise being made in the external tube to allow of it. The shape and the instertices in these plates are both alike, as shewn in the separate figure, *u*; by which it is evident, that the whole of the hot air may be confined to one apartment, or distributed variously into several. The apertures in the external air tube, through which the hot air flows into the rooms, are 10 or 12 inches in diameter, and they are each provided with a cover like a saucepan lid, *t*, the putting on of which in any room prevents the hot air from entering it, and allows the whole to proceed to the next above, as may be required. In the uppermost floor the hot air tube terminates at *w*, about 3 feet above the floor; from thence the smoke flue alone ascends, which first rises a few feet, then takes a horizontal course, and afterwards passing through the roof, the upper extremity is provided with a canopy or cowl, to keep out the rain, and prevent the smoke from being forced downward by gusts of wind.

Messrs. Coe & Moore's Printing-Office consists of four floors, as shewn by the section; these are of considerable extent; and they are thoroughly warmed throughout the winter, at as high a temperature as is consistent with the comfort of the persons employed, at the expense of less than 9d. *per diem* for fuel: but one of the chief advantages that result from this admirable calorific apparatus, is the convenient and facile manner by which the heat can be augmented to the required degree in any apartment, for the purpose of quickly drying the freshly-printed sheets of paper; an advantage evidently of the utmost importance to printers, as it enables them to complete their work with extraordinary dispatch.



CAPTAIN PHILLIPS'S PATENT SHIP'S COMPASS.

That indispensable and invaluable instrument, the compass, which guides the mariner over the trackless deep, has, we are happy to state, received some very decided improvements from the ingenious Captain Charles Phillips, of Upnor, near Frindsbury, Kent. The object is to prevent those derangements which sudden concussions occasion upon that delicate instrument; by which the card is not unfrequently thrown off its central pivot: such are the effects of the firing of cannon, stormy weather, the striking of the paddles of a steam boat, &c. The manner in which these evils, incidental to the common compass, are avoided by the new arrangements, will be understood on reference to the preceding engraving, and the annexed explanation.

The figure gives a vertical section of the improved compass. *a* is the standard, which consists of a hollow tube; this tube encloses a long spiral spring, which rests upon a bearing at *b*; to this bearing are fixed two handles, *c c*, by which it may be elevated within the standard, (compressing the spring) and the bearing rest in any of the notches, or recesses, Nos. 1, 2, 3, 4. On the other side of the tube similar recesses are made, for the opposite handle to rest in. *d* is a solid and moveable portion of the hollow standard *a*, made so as to slide freely within it. *e* is a cap, fixing on to the standard *a*, by a bayonet joint; the object of this cap is to prevent the spring from forcing out the sliding piece, *d*. *f* is the compass card, which rests

upon the pivot, *g*. This pivot passes through the cross bars, *l l*, and the lower end is formed into a spherical knob, better shewn at *h*, *fig*. 2, which exhibits the same parts on a larger scale. This spherical knob rests upon the flat surface of an agate, cornelian, or other hard stone, *i*, which lies in a recess upon the top of the piece, *d*, and is kept in its place by the cap, *k*, being screwed down upon it; the cap, *k*, is made concave in the upper part, to fit the spherical knob; so that the latter, resting at bottom upon a hard plane, and above in its hemispherical concavity, can turn freely in any direction.

At *m m* is shewn (black) the section of a leaden ring, which circumscribes the case of the compass as marked by the two parallel dotted lines; at *n n* are two handles fixed to the leaden ring, by which it may be shifted higher or lower on the case; and be fixed at pleasure at any height by the palls, *o o*, dropping into the racks, *p p*, which are screwed to opposite sides of the case. *q* is the steering or "lubber's point," which, instead of being fixed, is suspended upon a moveable joint, *r*, as a centre of motion, and oscillates as a pendulum; this centre being placed so as to slide between two vertical guides, it may be raised or lowered at pleasure; and is retained in its place by the pressure of a spring, fixed to the centre. *s* is a pendulum bob placed upon the vertical rod of the lubber's point; this bob has a spring fixed within it, which presses against the rod, and fixes it wherever it may be placed. The lubber's point should be adjusted so as to be even with the upper edge of the compass, by raising or lowering the moveable centre, *r*; and the bob, *s*, should be shifted in the rod, until it agrees with the centre of the leaden ring.

If the motion of the compass box should be too violent in a vertical direction, it is to be checked by raising the handles, *c c*, into one of the notches, 1, 2, 3, 4, as may be required to meet the circumstances. To regulate the oscillations of the compass box, according to the state of the weather, the leaden ring is to be shifted higher or lower, *according to circumstances*. In hard blowing weather, it may be raised even to the top of the rack; in fine calm weather it may, on the contrary, be lowered quite to the bottom.

From these very simple yet ingenious arrangements it is obvious, that these spiral springs, (regulated as before-mentioned) will prevent the injurious effects, vertically, from sudden concussions; and that the adjustable weights which alter the centre of gravity, according to circumstances, will prevent any violence laterally, while it keeps the lubber's point comparatively steady, in the severest weather; thereby giving confidence to the steersman, and additional security to the ship.

PARKER'S PATENT PAVED ROADS.

The method of paving *parts* of roads, for which this patent has been granted, consists in forming two parallel rows or lines, of hard materials, at a proper distance asunder to support the wheels of the carriages, which distance must be regulated by the medium length of their axles; thus forming a way or track for them, similar to a rail-

road. Five varieties of this method are described by the patentee; the four first relating to stone railways, and the fifth to a compound railway of stone and iron. In all the methods of making the stone ways, long blocks of granite, of a suitable breadth and depth, which latter is not particularized (but probably need not exceed a foot either way) are laid level in the manner before mentioned, and where the ground is soft must have sleepers of stone or other fit material placed beneath their joints; but where the ground is hard enough, the modes of jointing these stones (in which the difference of the four first varieties consist) will support them in their places sufficiently without any sleepers.

In the first method of jointing the stone blocks, one end of each block is to be cut so as to form a projecting angle of equal sides, and the other end so as to form a re-entering or hollow angle of the same dimensions, in the mode called the "bird's mouth joint" by stone cutters. In the second method, a cavity of a square or cylindrical form is cut in the middle of the ends of each stone, and a piece of iron formed to fit it; which being lodged in its place, when the stones are laid together, will keep them from moving singly in any direction from the line in which they are fixed. The patentee prefers cylindrical cavities and plugs, on account of the greater facility of their formation. In the third method a horizontal groove is cut across in the middle of the ends of each stone, and a corresponding piece of iron or hard stone is prepared for it, which will, when in its place, cause the stones to support one another at their extremities. In the fourth method two grooves are to be cut at the ends of each stone, crossing each other at right angles in the middle; and crosses of cast iron are to be made of suitable dimensions for them, which, placed in a similar manner to the other pieces, will equally prevent the stones from motion. The fifth variety is composed of pieces of cast iron, about 30 feet in length, of the same breadth as the stones mentioned, and of a suitable thickness, which iron pieces are to be laid on blocks of stone, placed in parallel rows like the others; and screw bolts are to be passed through the iron plates and stones, at proper distances, the heads of the screw bolts being countersunk in the plates, and their other ends drawn tight by nuts pressing against the under sides of the blocks, which in this mode may be made of a softer and cheaper sort of stone. *New Monthly Magazine.*

BAGSHAW'S PATENT EARTHEN PIPES.

This invention consists in a new and improved method of manufacturing pipes for the conveyance of water and other fluids. The process is as follows:

Cylindrical plugs of wood are to be provided of the same diameter as the calibre or "bore" of the pipes to be manufactured, and of the intended length. These wooden plugs are to be coated with a sufficient thickness of clay, or plastic earth, which has been duly prepared in the manner practised in the pottery manufactories. To

perfect the exterior form of the pipe, an external mould is to be employed, consisting of two semi-cylindrical pieces, which are to be placed on each side of the intended pipe, when the edges are to be brought together by screwing them up, which will press out the superfluous clay from the mould; the exterior mould being next removed, the pipe will be found completely formed upon the plug; in this state it is to be dried; after which the plug may easily be withdrawn, and the pipes finished, by being baked in an oven. The pipes are to be connected together by placing the smallest end of one into the largest end of another, and filling up the space between them with some liquid cement, such as Parker's Roman cement. The Patentee of this invention is Mr. Samuel Bagshaw, of Newcastle-under-Line.

History of the Steam Engine.

CHAPTER II. (*continued.*)

Contents.—HULLS' PATENT.—BLAKEY AND PERKINS.—MR. KEANE FITZGERALD'S SUBSTITUTE FOR THE CRANK.

Hitherto steam had been only employed in raising water, nor had any plan been devised by which it could be adapted to the giving motion to machinery; it had, indeed, been hinted at by Savery, who observes that his machine must be used for raising water on a wheel, which would give motion to a mill or other works: but since Savery's machine itself failed, of course the project perished with it. After the important improvements of Newcomen, it would appear evident that any effectual method must be very different from this; and, accordingly, we find a patent taken out in 1736, by Mr. Jonathan Hulls, of London, "For a new invented machine for carrying vessels or ships out or into any harbour, port, or river, against wind or tide, or in a calm." This new method was the application of the crank which now, it is well known, enables us to employ the steam engine as a prime mover in almost every species of machinery.

Unfortunately, the public mind was not sufficiently matured to interest itself in the project, and, in consequence, Hulls and his patent were so completely forgotten, that the invention has been subsequently claimed by Watt.

We should here observe, however, that whilst we give due praise to Hulls for the greatness of his project, we feel satisfied that Newcomen's engine was not at all adapted to the proposed combination; as the great difference in power between the ascending and descending stroke of the piston would have required a ponderous fly wheel to have any thing like equality of motion. The idea, however, was great, and the ingenious inventor deserved better success than he obtained.

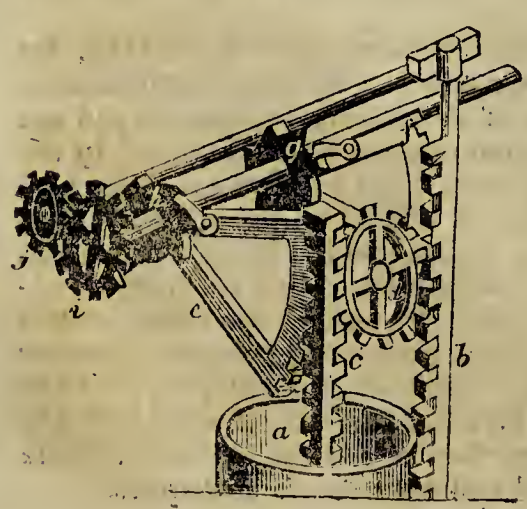
We should not omit in this place to notice Blakey's patent, in 1766, for improvements on Savery's method of raising water. To avoid condensation he proposed to introduce oil on the surface of the water, because oil did not so readily absorb the caloric: but his principal improvement consisted in the boiler, which consisted of small tubes, completely filled with water. The proposed improvements drew forth the attention of almost all the scientific men of his day, many of whom declared it possible to conduct the influence of steam to the centre of the earth. "But," says Hornblower, "an accident terminated the event as to the experimental engine, by one of the steam vessels bursting through the force of steam, though much under the degree of power proposed by the Cornish gentlemen. Such" continues Hornblower, "is the degeneracy of man, that whilst the States General of Holland were pluming Blakey with the gaudiest expressions of approbation, not one instance is to be found, in which he met with that support he had been led to anticipate."

The drawing here given exhibits Blakey's boiler, or generator, the principle of which, our readers will observe, has been renovated in Perkins's recent attempts. The success attendant upon the renovation has fallen short of calculation, but this has been owing rather to the mode of application than to the generator itself, which for safety and portability never will be surpassed. The cause of Perkins's failure we shall notice in its proper place.—

a represents the furnace in which the tubes, *b*, *c*, *d*, are placed which are connected by small pipes; *f*, is a funnel for supplying the generator with water. This was the ancient mode of supplying all boilers, but it is needless to observe that, since the addition of the force pump, the former has been unnecessary. *e*, is a cock for the purpose of cleaning the boiler, by running water through the whole. The pipe which connects the generator with the engine is not shewn.

Mr. Keane Fitzgerald, a gentleman of great scientific acquirements, and whose ingenious discoveries stand recorded in the Philosophical Transactions, describes, in the year 1758, an invention, by which he proposed to obtain a rotatory motion from a rectilineal one, in another way than by the crank, the application of which was unknown to him. No drawing has ever been given, and we therefore give the accompanying sketch, which we gather from the words of the inventor: they are as follow:—

"A rotative motion may be obtained from a rectilineal one, by employing a combination of large toothed wheels and of smaller ratchet wheels, worked by teeth upon the arch or sector of the beam, one of these ratchet wheels being put in motion by the ascent of the beam, and standing still during the descent, when another ratchet wheel is moved by an intervening wheel in the same direction as the first; and thus the two communicate a continuous rotative motion to the axis upon which they are placed, which is thence transmitted by a large toothed wheel to a smaller wheel or pinion, on the shaft of which is *a fly to accumulate momentum*, and crank proposed to be applied to work ventilators, and to many other useful purposes. The fly, by accumulating in itself the power of the machine during the time it was acted upon, would continue in motion, and urge forward the machinery whilst the steam engine was going through its inactive returning stroke."



Let *a*, then, represent the cylinder on the principle of Newcomen. *b c*, two racks, of which *c* is the piston rod; these racks are toothed on two angles, two for the purpose of being moved by, and giving motion to the connecting pinion, *d*, and the remaining two for the purpose of working the sectors, *c f*, these sectors have palls or catches fixed on each of them, which are situated so as to fall into the teeth of the ratchets, *g h*. We will now suppose the piston rod or rack, *c*, to be ascending: then the catch on the arm of the sector will turn round the ratchet, and the axle upon which it is fixed, a

portion of a revolution. This motion will be continued until the piston has reached the top, when the pall of the sector, *f*, falls into the next tooth of the ratchet. The motion of the piston is now reversed; but by the intervention of the pinion, *d*, the rack, *b*, begins to ascend, and repeats the same operation upon the ratchet, *g*, as the other sector did upon *h*: thus, the two sectors alternately act upon the ratchets, and keep the axle in a continuous rotative motion; this motion is communicated to another axle by the wheels, *i*, *j*: on the latter axis a fly is fixed, which preserves the motion equable and regular.

We admire the ingenuity of this invention, although we are satisfied it would never answer the proposed end. The principal objection would be that of the piston striking violently the top and bottom of the cylinder; because, as the motion of the fly is obtained from the direct action of the piston rod, any decrease of speed in that must likewise decrease the speed of the fly-wheel, and therefore produce an irregular motion. Not so the common crank, which naturally retards the motion of the piston as it approaches the top and bottom of the cylinder, whilst itself revolves at the same speed throughout.

[*To be continued.*]

MECHANICS' INSTITUTION, SOUTHWARK.

On Monday Evening a respectable company assembled at the Globe, in York Street, Borough Market, to form a Mechanics' Institution, for the Borough of Southwark, after some observations on the advantages and utility of such Institutions, it was unanimously resolved,—

"That it is expedient to form an Institution, in the Borough of Southwark, for the improvement and instruction of Mechanics and others, in the principles of the arts they practice, and in such branches of practical knowledge, as will be conducive to their general improvement."

A Committee was appointed to carry it into effect, with instructions to solicit the assistance of those, who would co-operate in the undertaking, and the result of such applications to be laid before another meeting to be held at the same place, on next Tuesday Evening, at 8 o'Clock precisely, when the attendance of every Friend to Mechanics' Institutions is earnestly requested.

London Mechanics' Institution,

WEDNESDAY, 26th of APRIL, 1826.

MR. WALLIS'S FOURTH LECTURE ON ASTRONOMY.

COMPOSITION OF FORCES: RECTILINEAR, AND CURVILINEAR MOTION; THE LATTER PRACTICALLY SHOWN TO RESULT FROM THE COMBINATION OF AN EQUABLE WITH AN ACCELERATING FORCE.—PLANETARY MOTION EXPLAINED ON MECHANICAL PRINCIPLES.—CONTINUATION OF THE SUBJECT OF THE TIDES.—SPRING, AND NEAP TIDES.

Mr. Wallis commenced his Fourth Lecture by observing, that it might have been remarked he had been frequently led into digressions: but this arose from the peculiar nature of astronomical science, and its accumulating evidence. On the present occasion, he should quit for a time the subject of the tides, with which he closed his last lecture, and refer to the composition of forces, and their application to planetary motion.

The simplest idea that we had of motion was, the *inertia* of a body being overcome, and that body being impelled in the direction of a straight line with a given and uniform velocity. This was reasoning on the simple principles of *dynamics*, supposing friction and the action of the atmosphere removed.

To effect this motion there was but one force requisite. It should, however, be stated that there was in reality no such motion in the universe, every body moving in a curved line; even the comets themselves move in elongated, ecliptical curves. Having stated, that planetary motion results from the composition of forces, he should proceed to render the principle more intelligible by means of a diagram.

Mr. Wallis then exhibited a diagram in the form of a *parallelogram*. He supposed a body impelled by an *equable* force horizontally. By an *equable* force he meant such power as would cause a body to move over equal spaces in equal times. Now supposing a body so impelled acted upon at the same period *vertically*, by a second force similar to the one just described, the result would be, that the body influenced by the two equal forces instead of proceeding horizontally would describe a line between the two, that is to say, it would always describe the *diagonal* of the *parallelogram*. This, then, was what is termed *rectilinear* motion, it being motion resulting from the operation of equable or two equal forces. In the composition of forces motion was lost: for the body would not describe the *diagonal* of the parallelogram in the same time that it would have described the horizontal line.

Mr. Wallis then exhibited another diagram, to shew that *curvilinear* motion proceeded from a body being operated upon by an *equable* and an *accelerating* force or gravity. It was shewn that a body operated upon by these two forces must describe a curve.

Mr. Wallis, begging that to be borne in mind which he had stated during the last lecture, namely, that a body fell as the squares of the distance, proceeded to describe a most ingenious apparatus, the object of which was, mechanically, to elucidate the principles just laid down. The machine consisted of a wooden frame-work, containing an outward and moveable frame. From one of the angles an ivory ball was suspended, and so controlled by a little simple mechanism, that by the gradual sliding out of the moveable frame the ball was subjected to the actual operation of two equable forces; and described with precision the diagonal of the parallelogram.

Mr. Wallis said the above might lead them to account for planetary motion, but was not of itself sufficient to explain it. He should, therefore, proceed to shew, through the medium of the same machine, *curvilinear* motion, which could only be accounted for on the principles of gravitation and projectile force. The ivory ball was then suspended by a thread running in a pulley, and the other end of the line was wound round a cone. It was so arranged, that the drawing out of the moveable frame pressed upon and impelled the ball horizontally with an equable force, and at the same time unwound the line on the cone, which gave to the ball an *accelerating* or gravitating force, and its motion was, consequently, *curvilinear*, or in a circle. Mr. Wallis observed, that he believed this mechanical arrangement had never been thought of before; it was very simple, and explained--not by any trick, but by absolutely deriving effect from the principles which it was to elucidate—all the difficulties surrounding the subject.

Mr. Wallis then said he would proceed to apply the principles he had just laid down to planetary motion, and to render this more intelligible he introduced another diagram. The sun was here represented somewhat out of the focus of an ellipsis; and it was shewn, that if the earth were projected in a right line by an equable force it would proceed horizontally; but that as soon as it received, through the attraction of the sun, an *accelerating* or *gravitating* force, it would acquire *curvilinear* motion, and describe an ellipsis round the sun, approaching nearer and nearer to this body till it reached the opposite point of the sun's orbit. Now it might appear that the earth on reaching this position would fall into the sun, in consequence of its greater proximity to, and the increased attraction of the latter; but this was counteracted by the earth's *accelerated* motion having received additional impetus. It was then explained that the earth would complete its orbit, retarded in its velocity. The increased motion of this body was accounted for by its being

observed, that the force of attraction is at one period in the line of motion. The earth being prevented, then, by the increased motion it thus acquires falling into the sun, it follows, the same force which brings the earth nearer that body carries it away again. This was fully explained by the worthy Lecturer, and the ellipsis which the earth describes was shewn on the diagram.

Mr. Wallis then referred to the different orbits of the earth and moon, and described their relative proportions. He stated that the line of the moon's orbit is *convex* towards the earth, and it is always *concave* towards the sun. This was universally the case. He should endeavour to show the real curvature of the moon's orbit by means of a beautiful contrivance invented by Ferguson, and the proportions, also, between the orbits of the moon and the earth. This ingenious apparatus was then exhibited. At one end was placed a white ball, to represent the sun; and the *radius* of the earth's orbit was described by a rod, five or six yards in length, proceeding from that luminary. There were two wheels: one next the sun, and the other at the extreme end of the rod communicating motion to the earth. It was described, that the wheel affecting the sun caused it to revolve 13 times and $\frac{1}{3}$ round the earth, while the other wheel caused the earth to complete one revolution round the sun. In the small wheel pencils were fixed. Their distance from each other was one 400th part of the radius. The nearest would represent the distance of the moon, and the farthest pencil, the distance of the earth from the sun. Mr. Wallis said this machine was calculated to describe about a month of the moon's orbit. The apparatus was then put in motion, and the pencils described on a long sheet of paper the two orbits. Mr. Wallis explained, that during the moon's elliptical motion round the earth, the former, twice in each month, crosses the orbit of the latter. Several papers, with the relative proportions of the orbits described upon them by the machine, were then handed about the Theatre, to the evident satisfaction of the members. The lines described on the paper were about half-an-inch apart, concave towards the sun, and intersected each other at distances of nearly two feet.

Mr. Wallis then proceeded to account for that phænomenon called the harvest moon, which he described as being nothing more than the full moon rising for several nights together at nearer the same time, than during any other period in the course of the year. To assist this part of the subject Mr. Wallis introduced one of his many beautiful transparencies. He observed, that the moon advances towards the east about 13 degrees every 24 hours in her passage round the earth. Now she would, therefore, constantly rise three quarters of an hour later every succeeding evening if her orbit lay in the *plane* of the *equator*, which always makes *equal* angles with the horizon: but, as her orbit is nearly in the plane of the ecliptic, and different portions of this circle rise in the same time, according to the degree of obliquity it makes with the horizon of any place, it follows, that as the ecliptic and horizon form a greater or less angle with each other, so the moon will rise on any two successive nights with a greater or less difference of time. Mr. Wallis then referred to a globe, and showed that this angle in our latitude is always least when the moon is in the sign of *Aries*, where the ecliptic enters the equator. Any portion of her orbit, therefore, when she is in that situation, will require less time to get above the horizon than when the angle is greater. The moon, too, is at its full in the autumnal quarter, and, when in this sign, she rises almost immediately after the sun sets, and for several successive nights. When the moon is in the opposite sign, *Libra*, the same phenomena occurs in the south. These principles were very fully and lucidly explained by the worthy lecturer.

Mr. Wallis then resumed the subject of the tides. He stated that there were two, a solar and a lunar one; and he explained that they have a joint or opposite effect according to the situation of the bodies that produce them. The worthy Lecturer then exhibited some beautiful transparencies representing in an extraordinary manner the flux and reflux of the waters, the causes of which he explained as the changes became apparent. He observed, that when the attractive influence of the sun and moon conspired together, the flux and reflux were most considerable. This it was that produced the spring tides. It was then shown that at the moon's first and third quarters the effect was exactly the contrary, the flux and reflux were then diminished, which produced what is called neap tides. A transparency was then exhibited showing the earth

surrounded by the waters and the sun and moon in conjunction. The spring tides were here occasioned by their joint attraction. The moon was then shown at her quadrature, her influence operating at right angles with the attraction of the sun. As the attracting forces were now opposed to each other their influence was lessened and neap tides were the result.

Mr. Wallis then observed, that there were many tides proceeding from local circumstances which might appear to contradict the principles he had laid down; but they were all to be accounted for. Mr. Wallis here introduced a transparent map of Great Britain, and pointed out three currents produced by the peculiarity of our local situation. He shewed that one of these currents or tides passes between Great Britain and Ireland; the second passes to the north of Scotland and finds its way back through the German ocean; the third passes the British channel, and meeting the tide which had passed round the eastern coast and through the German ocean, at the mouth of the Thames, causes that disturbance in the water at the Nore which has been so frequently remarked. The tides of the River Thames also are not attributable to the direct attraction of the moon but result from the swell occasioned by the confluence of the tide in the German ocean with that of the British channel. Mr. Wallis observed also that there were great variations in the height of the tides, which depended on the nature of the coasts or the streights they had to pass through. The Mediterranean and Baltic seas had very small elevations, while at Bristol the tide rose from 7 or 8 feet to 50 or 70. In many situations this extraordinary difference was effected most suddenly.

Mr. Wallis concluded by exhibiting a superb transparency, on which were delineated the twelve signs of the zodiac. Within the circle described the earth was seen revolving on its axis, and the moon completing her orbit. Mr. Wallis said that spectators were supposed to be placed at a great distance above the Northern Hemisphere, observing the tides as they occurred during the moon's change in her orbit.

The worthy Lecturer concluded his very instructive lecture with some further remarks on the difference in the height of the tides, which were attributable to local causes: and announced that, in his next, which would be found very interesting, he should treat on the precession of the equinoxes. On his retiring a most lively expression of satisfaction burst from the meeting.

After the lecture the excellent chairman requested the attendance, at 8 o'clock in the evening of the 4th of May, of those members who had applied for admission to the French classes, when Mr. Black would commence giving instructions.

TO OUR READERS AND CORRESPONDENTS.

A descriptive account, with engravings, of Mr. Jacomb's patent Steam-boiler Furnaces, and Domestic Grates, will appear in our next Number; which will also contain accounts of several other important inventions and discoveries, not yet published.

In reply to "A Constant Reader" (dated *Liverpool*, for we have so many Correspondents who assume this cognomen), we purpose in our next, or, at latest, in our succeeding Number, to give a full description of Mr. James's Patent Locomotive Railway Carriages.

J. P. and E. W———e will have our earliest attention.

H. L.'s proposed new Construction of Candles,—and An Artizan on Improved Chimnies, are intended for insertion at the earliest opportunity.

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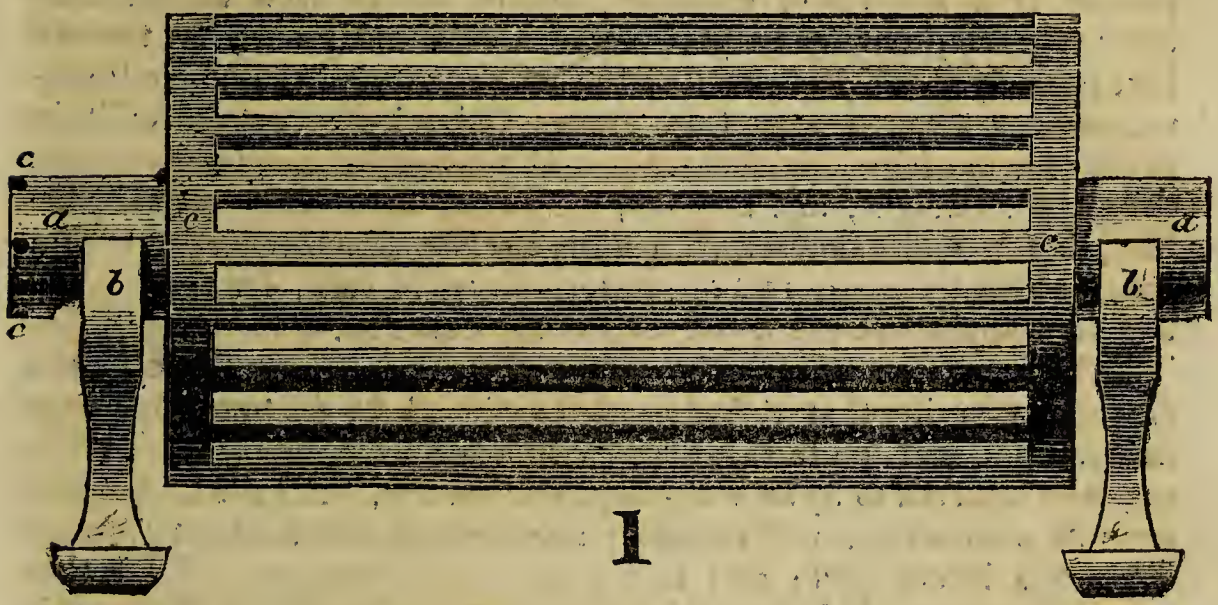
CONTENTS:

Jacomb's Patent Grates, ... 354
Monument to Sir Hugh Middleton, and Improvements near the New-River Head 357
Portable Fire Escape..... ib.
Cultivation of the White Poppy,. 358
Coal-Mines in France, 359,—Alum Mine, ib.—French Process in Silvering Buttons, &c. ib.
Improved Microscopes, ib. .....
Improved Liquor Cock..... 360
Tulloch's Patent Machinery for Sawing Stone 361
History of the Steam Engine, Chap. II (continued) 362
London Mechanics' Institution, Mr. Wallis's Fifth Lecture on Astronomy 365
New Patents,—List of Expired Patents,.. 368



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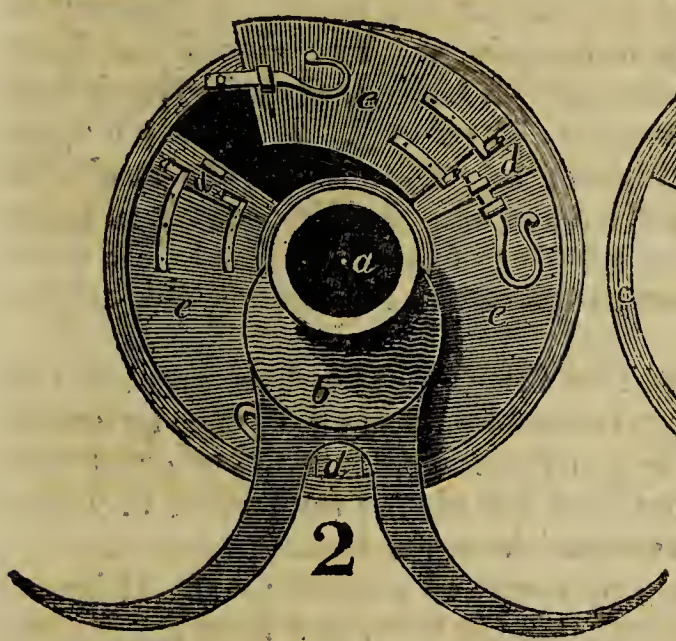

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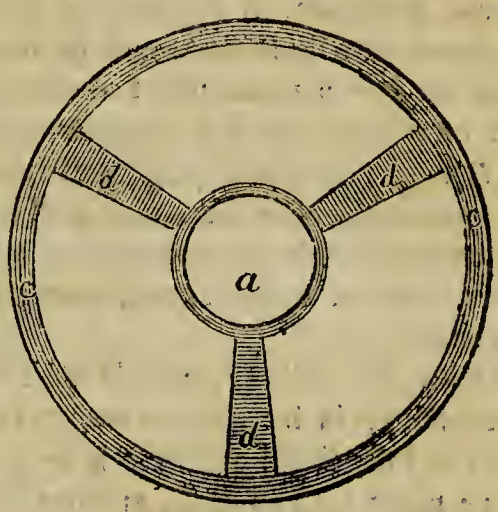

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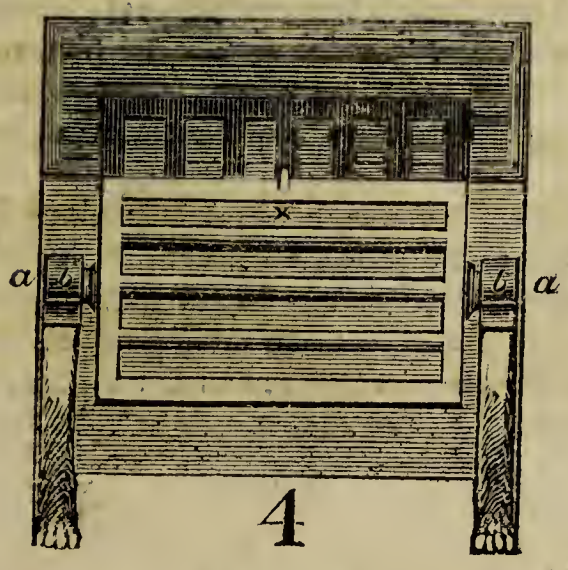

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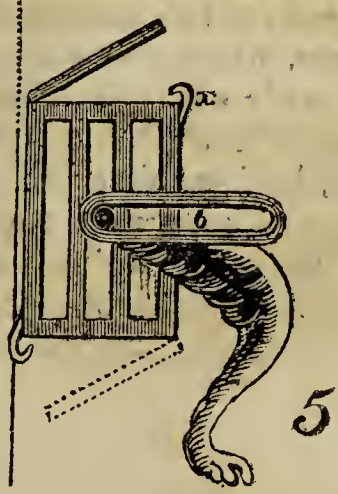

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JACOMB'S PATENT GRATES.

JACOMB'S PATENT GRATES.

It were needless at this time of day to enter into a grave dissertation upon the preposterous losses and the evils consequent from the non-consumption of smoke. Essays have been written, books published, schemes formed, inventions contrived, contrivances invented, and patents sealed: yet here we stand in these luminous times besmoking and besmoked, as our forefathers did and were before us. Few things have, more than this, engaged the attention of practical people, from motives of economy, and of others, from motives still more salutary; but the subject has been an unlucky one; for the evil has, in many cases, but reverted to themselves, and they have themselves been smoked more than ever. Chimnies have been built in every variety of form and feature; of all sizes and dimensions—plain, decorated, straight, and crooked,—crowned with every conceivable bird, beast, and nondescript, (to say nothing of old wives), with a vane, without a vane, and all, nevertheless, in vain, for the remedy has been applied at the wrong end of the chimney.

The usual plan of obtaining artificial heat ought surely to be the cleverest; seeing that it has been sanctioned by custom from time immemorial, and, up to this day, (with a few exceptions) most reverentially adhered to by all well-disposed persons. All the heated air, from its own levity, will naturally rise through the readiest channel of escape it can find; and as the chimney is constructed for that especial purpose, it follows of course that the top of the chimney is the place where most heat is to be gained. The quantity of heat radiating into a room must necessarily be trifling, therefore fresh fuel must be added—and it is *superadded* accordingly. It is thrown upon the *top* of the already ignited part; by which means the smoke or gas, which thereby becomes extricated, also rapidly ascends in huge volumes through the chimney—a source of immense loss to the consumer, and of intolerable, though tolerated, nuisance to the neighbourhood.

It is, we believe, admitted that the *flame* of a fire, and not the red cinders, is by far the most valuable part, and if this be so, it requires but little reflection to convince ourselves, how great and severe must be the loss, arising from the almost total waste of every particle of the smoke or gas, evolved from the fuel.

The cause of this evil being apparent to scientific men, it has of late years been a desideratum to devise the best, and most convenient means, of supplying the fresh fuel *underneath* the ignited part, instead of above it; by which arrangement the smoke would be instantly disengaged by the heat, and be made to travel *through the burning part above*, where it would be brought into a state of combustion, and be thus made wholly available.

In our recent numbers we have described several ingenious inventions, having this object in view; the patented invention by Mr. Jacomb, which we have now to describe, belongs to the same class; but the means by which he attains the object are totally novel, and possess strong claims to public attention, on account of their extreme

simplicity, and little cost: they are, besides, equally applicable to steam engine boilers as to domestic grates; and a reference to the engravings will shew the principle and construction of them for such purposes.

Fig. 1 represents an elevation or side view of a cylindrical furnace, or stove grate, supported upon its hollow axis, *a a*, which rests and revolves when required (as will hereafter be described) on the supports, *b b*. The external horizontal bars which contain and constitute the support of the fuel, are rivetted, or otherwise fixed to the circular ends, *c c*. *Fig.* 2 gives an end view of this cylindrical furnace, by which it is shewn that the cylinder is closed at one end, and divided into equal portions or compartments by the bars, *d d d*, at the other end: these divisions extend the whole length of the cylinder, so that the furnace is thereby divided into three (or it may be any other number of) distinct compartments, into which the doors, *e e e*, severally open and communicate. *a* represents the interior hollow axis, which is likewise connected by bars from end to end; through this opening, *a*, air is admitted for the support of combustion, and for the requisite stoking or clearing the fire of ashes and other residuum, as well as for the introduction of steam, tar, or other material, for increasing the combustion. *Fig.* 3 is a plan of one of the end circles or frames, *c c*, with the arms or bars, *d d d*, as before described.

Several modifications of these arrangements are proposed by the patentee, such as fixing the external bars on separately, or in segments, which segments may, if required, be formed by means of a simple contrivance, as the doors or openings for the introduction of fuel, and for other purposes. Other variations (but on the same principles) are proposed by the patentee, to suit the purposes to which they may be applied, which every workman, conversant in the construction of stove grates, will readily understand.

In putting the apparatus described into operation, when applied to a boiler for generating steam, it is to be placed within a flue or passage through the boiler; so formed as to admit the apparatus to revolve on its axis, with the feet, *b b*, resting on the bottom of the flue; and it should be inserted so far within the flue, that the end at which the fire doors, *e e e*, are fixed, should be flush or parallel to the outside of the boiler, as shewn at *Fig.* 4. In this position, the whole of the space between the exterior and interior cylinders are charged with coal, coke, or other fuel, and the uppermost portion is then lighted or fired, air being admitted through the open end of the cylinder, *a*, and through the bars of which the same is formed. As soon as that portion of the fuel contained in the uppermost compartment is burned to that state in which it gives off no more smoke or vapour, the whole cylinder is to be gradually turned in its hollow axis, in order that a portion of the fuel contained in the adjoining compartment may become also ignited. By this action it will be seen that the smoke, generated by the lighting of that portion of the fuel beneath, or immediately contiguous thereto, is compelled to pass through the first lighted portion, and is thereby consumed.

When fresh fuel is required, it is to be thrown into the uppermost division through the door, *e*, and upon the top of the live or ignited fuel contained therein; the cylinder is then to be turned on its axis so as to bring the fresh fuel under that which is ignited; the cylinder being turned as often as may be required, to keep the live fuel on the top.

By this arrangement it will be observed that all the component parts of the coal are made available for the production of heat, and the draft of air conveyed to the centre of the fire in any quantity, and which may be regulated to the greatest nicety through the centre of the cylinder.

The rotatory motion occasionally given to the furnace is to be effected by a lever inserted in the holes on the end of the axis, shewn at *c c*, *Fig.* 1, or by some other simple mechanical contrivance, the nature of which will depend upon the size and situation of the apparatus.

In applying the principle of this invention to domestic stoves, or fire-grates, the arrangements are materially different; an elevation or front view of one of these is given by *Fig.* 4; of which *Fig.* 5 is a side view. It will here be seen that the receptacle for the fuel in these also turns upon an axis, *a a*, which rests and slides in a longitudinal groove, *b*. There are two doors or openings for the supplying of the fuel, one at top, and the other at bottom, and when shut they are made fast by the catches at x x. These stoves are put into action by lighting a fire in the ordinary manner with coal or other fuel, as near as possible at the top, preferring to place uppermost some cinders, and green coal undermost; the fire will then gradually find its way to the bottom, burning with little or no smoke, which, together with the gas, or vapour, is consumed as emitted.

When fresh fuel is required, it is to be placed on the top of the ignited fuel, and the door shut down and secured by the catch, x; the grate is then to be drawn forward in the groove, *b*, and turned round one half of a revolution on its axis; and then be returned back again to its former position in the groove. By this action, the live or ignited fuel is again brought to the top, thereby causing the smoke emitted by the fresh fuel to pass through that which is already in a state of ignition, and be consumed.

The selection of the materials, and the diversification of designs and proportions for the construction of the stoves, will of course depend upon the use to which they are applied; the arrangement of the principal characteristics of the invention is peculiarly favourable to the combination of elegance with utility.

The substantial advantages that will result from Mr. Jacomb's inventions, are the conversion of gas and smoke into a bright flame, instead of permitting it to escape up the chimney: thus economising fuel, by making use of every available particle, and the abatement of a great nuisance by the consumption of smoke.

MONUMENT TO SIR HUGH MIDDLETON, AND IMPROVEMENTS NEAR THE NEW RIVER HEAD.

(From a Correspondent.)

"The New River Company having let the ground between the New River-Head and the New Road, two spacious squares are being built on the spot, one is named Middleton Square, the centre of which will be adorned by a new church of great architectural beauty; the other square, which is open on one of its sides to the new road, is called Claremont Square; and encloses a large quadrangular reservoir of water belonging to the New River Company. This reservoir was surrounded by an old, massive, high wall, of very unpicturesque aspect, which the Company are now (with a judicious liberality) having pulled down, and substituting in its place an elegant iron railing, through which will be seen the fine sheet of water, with a plantation on its surrounding bank. The effect of this alteration will be to render this new square, if not the most magnificent, certainly one of the most pleasing, agreeable, and healthy in the metropolis; being situated upon nearly the highest ground in the vicinity of London, the air is remarkably pure, when its proximity to so populous a city is considered."

Now, Sir, it has long been admitted as a reproach to the inhabitants of London, that no public monument has ever been erected to that man, to whom they are so deeply indebted for one of the chief necessaries of life; who spent a large fortune, and finally ruined himself, in completing his gigantic undertaking of bringing a river of fine pure water from the vicinity of Ware to London. The present generation may, however, wipe off the stain, by availing themselves of (perhaps) the *most* appropriate site for the erection of a monument to his memory. I would suggest, for this purpose, the centre of Claremont Square; in the middle of the reservoir, surrounded by his own element, the statue of Sir Hugh Middleton, mounted upon a lofty and massive pedestal, would look imposingly ornamental, and form a far more interesting and satisfactory object to every enquiring mind, than the effigies of many of the dignified persons which adorn some other public squares. Claremont Square is open to the New Road, Pentonville, which is one of the greatest thoroughfares about London.

In the hope that the hint I have thus thrown out may be taken proper notice of, through the medium of your widely-circulated Journal, and induce some active and influential person to take the matter in hand, I remain, Yours, &c.

Penton-street, Pentonville, D. H.
1st May, 1826.

PORTABLE FIRE ESCAPE.

To the Editor.

SIR,

HAVING frequently witnessed the great danger, confusion, &c. occasioned by fire, permit me to offer a plan for the

removal of persons and property from houses wherein that destructive element is making its ravages; and where the lower part of the building is so much ignited, as to prevent access to the upper by means of the stairs.

I propose to have a series of poles (each about 6 or 8 feet long) to be connected together by sliding joints, similar to those used in fixing bayonets to muskets; the form of each separate pole to be such, that when put together, the whole shall be tapering as those used in scaffolding. The upper end of this pole is to be furnished with a pulley block, the rope from which is to be attached to a deep basket, for the purpose of being drawn up to the windows of a house, and let down again with whatever may be rescued from the flames. The bottom of the pole may be made fast to the area railing, or be prevented from slipping by any other means. I would recommend that every watch house and engine station be provided with one or more of such poles, &c. which, being detached and numbered, might easily be carried, and fixed up in a few minutes; and be the means of rescuing many lives, and much property, at a very trifling expense.

When the poles were not wanted for the purposes above mentioned, they might be employed with great advantage in forming barriers across the street, to keep off the swarms of thieves, who hover about a house on fire for the purpose of plunder.

Penton Street, Pentonville, D. H.
29th April, 1826.

CULTIVATION OF THE WHITE POPPY,

FOR OBTAINING BRITISH OPIUM.

The Society of Arts have, for some years, offered premiums to encourage the cultivation of the white poppy, for the purpose of obtaining opium from it. The communications received from Mr. Young, of Edinburgh, from Mr. Jeston, and from Messrs. Cowley and Staines, are inserted in the 37th., 38th., 41st., and 42nd. vols. of their Transactions. From these it appears, that in common seasons, and by proper management, the produce per acre of opium is such as to yield a fair return of profit to the grower. The opinions of professional men have also been published, shewing, that British opium, in its medicinal properties, is at least as efficacious as the best in the market, namely, that from Turkey. It still remained, however, a desideratum to ascertain, by a careful comparative experiment, the relative proportions, in British and foreign opium, of that vegetable principle called morphia, to which the effects of this drug on the human constitution are owing.

Mr. H. Hennel, a member of the Society, and chemical operator at Apothecaries' Hall, where the extraction of morphia from opium

forms part of the regular business of that great establishment, was requested to undertake this examination. Opium prepared by Messrs. Cowley and Staines was furnished by the Society for this purpose, and the result was, that 700 grains of dried Turkey opium yielded 48 grains of morphia, and an equal quantity of dried English opium yielded 53 grains of morphia.

The process pursued with each was, to infuse the opium in dilute acetic acid, and then to decompose the acetic solution by ammonia; the precipitate thus obtained, was digested in hot alcohol, and the morphia was obtained therefrom by crystallization.—*Trans. Soc. of Arts.*

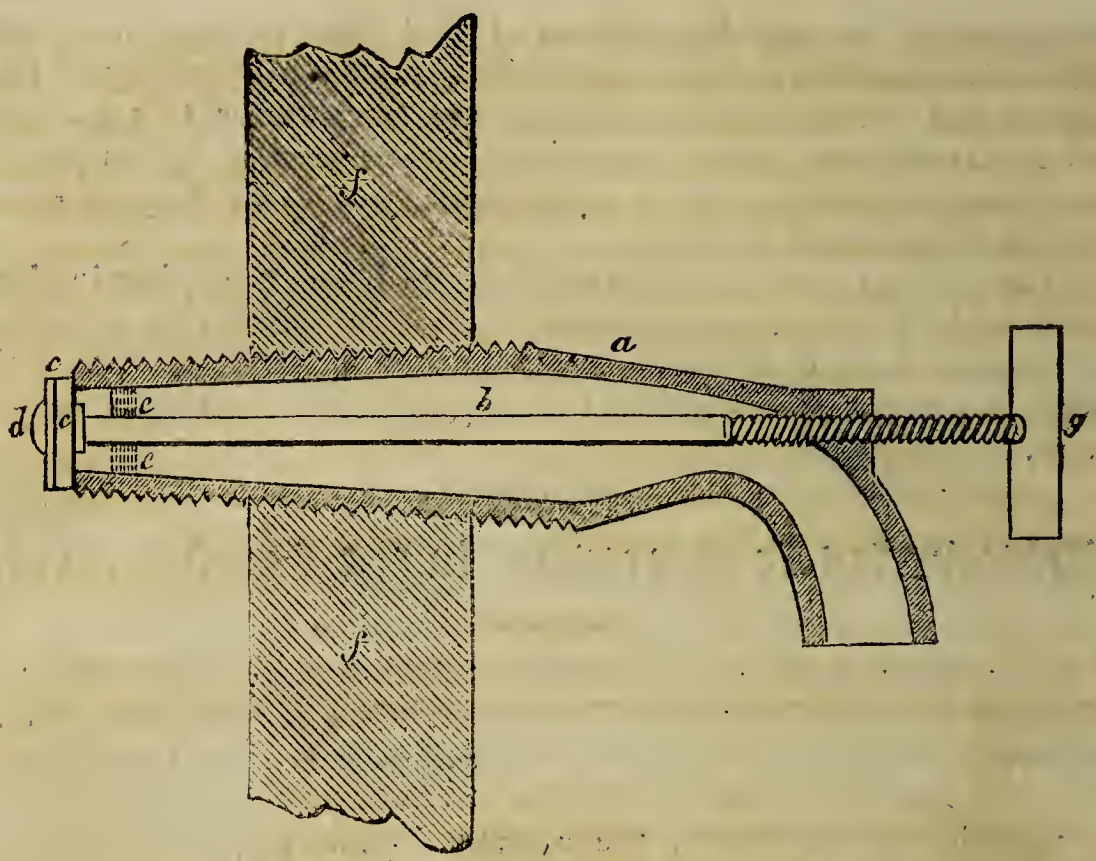
Discoveries & Processes in the Useful Arts.

Coal-Mines in France.—There are reckoned in France 236 coal-mines, from which 9 or 10 millions of quintals of coals are annually extracted; the value of which is estimated at from 10 to 11 millions of francs on the spot, a value which rises to forty millions (£1,666,666) as regards the consumer; the carriage, amounting to three, four, and even ten times in some places, the price of the coal at the mines. These 9 millions of quintals are, however, trifling when contrasted with the quantity of coals raised in England, which amounts to 75,000,000 of quintals annually. The Carron iron-works, in Scotland, alone, consume 8,000 quintals weekly.—*Annales des Mines.*

Alum Mine.—An alum mine has recently been discovered in the valley of Maudaille, at the foot of the mountain of Puymary, one league from the valley of Des-Chazes, and the same distance from the great road, which leads from Murat to Aurillac, in Auvergne. This aluminous rock, the same as that of Mont d'Or, is comprised in the Basaltic soil of the extinct volcanoes of that country.

French Process in Silvering Buttons, &c.—Dissolve in nitric acid 1 oz. of silver; then add a mixture (in powder) of 1 oz. of sal ammoniac, 1 lb. of cream of tartar, ½ oz. of sandiver, 8 oz. sulphate of zinc, and 2 oz. muriate of soda. These are all to be boiled in a glazed earthen vessel, into which the buttons (previously prepared by dipping them in aquafortis) are to be thrown in, and agitated by a rod for several minutes; when they are to be taken out and cleared by immersion in a weak solution of nitric, and afterwards washed and made quite dry.

Improved Microscopes.—Compound microscopes, both refracting and reflecting, can be placed completely on the same footing with telescopes, and reduced to the same accurate discipline in their construction. They are, in fact, nothing but telescopes adapted to act with diverging rays instead of parallel ones. Dr. Goring suggests, in the Quarterly Journal of Science, that the term *engiscope* would, perhaps, be very applicable to them in their perfect form, which appears to be an improvement by Dr. Goring upon the reflecting ones constructed by professor Amici, of Modena.—*Monthly Mag.*



IMPROVED LIQUOR COCK.

To the Editor.

SIR,

BEING desirous to contribute all in my power to your very excellent and useful Miscellany, I beg leave to offer for insertion a description of a new Liquor Cock of my invention, should you agree with me as to its uses and advantages, or consider it an improvement upon previous contrivances for the same purpose.

a is the barrel of the cock, made of *cast iron; b*, a small iron rod screwed through the barrel at *g*, and united at the other end to a valve with a leather seat, which shuts against the tail of the cock, as shewn at *c;* this end of the rod is put through the seat, also an iron washer, and then rivetted at *d;* the rod is guided by passing through a piece of metal at *e;* which guide piece is also perforated all over its surface, to admit the easy passage of the liquor. *ff* is a section of the cask with the cock screwed into it.

To draw off any liquor the handle *g* is to be turned, which moves the screw, and by the connecting rod, the valve from its seat; opening thereby a passage for the discharge of the liquor; to shut off the liquor, the operation is, of course, to be in the reverse direction.

The estimated expense of these cocks is about eighteen pence each; they combine the advantages of a perfectly tight cock, with those termed *anti-corrosion* cocks; and, with respect to the first mentioned, it should be noticed, that the more liquor there is in a cask the tighter the cock becomes, owing to the weight of the liquor pressing the valve more closely (*i. e.* with greater force) against its seat. The employment of cast-iron for the construction of the barrel of the cock and other parts in contact with the liquor, I consider to be far preferable to brass, and other alloys of copper, commonly used for the purpose. The corrosion of *cast*-iron, by an acetous liquid, I

have found to be very slow indeed, so as to bear no comparison with the oxidation of the cupreous alloys when exposed to the action of the same liquid. When cast-iron becomes slightly oxided by long usage or neglect, there is produced only a very minute quantity of a harmless (I might, I believe, add a salubrious) salt; but by the oxidation of the latter, an acetate of copper or verdigris is rapidly and abundantly formed, a very small portion of which is a deadly poison; the quantity of verdigris is, indeed, often so great as to stop up the liquor passage.

For the reasons given, I am inclined to believe that my invention possesses advantages not only of a mechanical nature, but that its adoption would lead, in many instances, to the preservation of health, or at least, to the prevention of taking, in a greater or less quantity, a metallic poison into the stomach. I remain, &c. &c.

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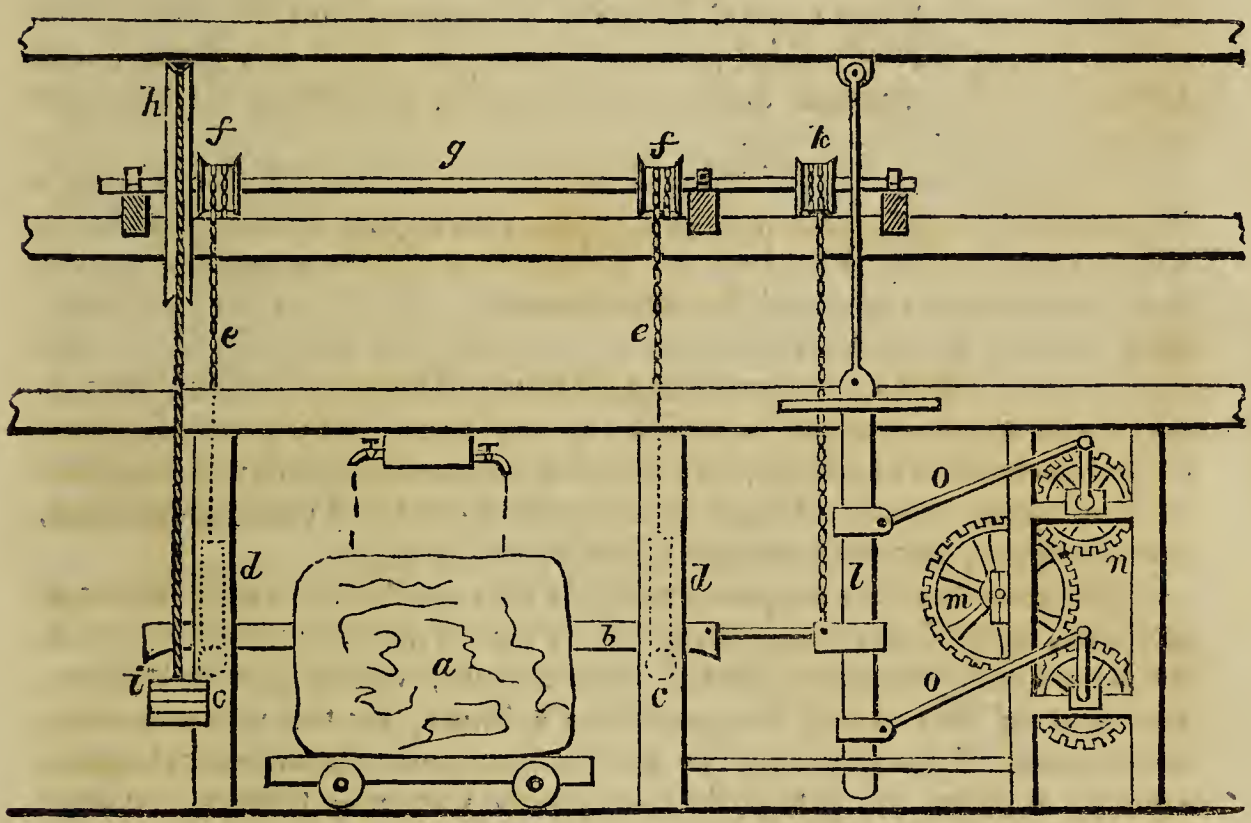

TULLOCH's PATENT MACHINERY FOR SAWING STONE.

The usual method of sawing marble and other hard stone, is, as all our readers must have observed, the most iusufferably tedious of any operation in mechanics, and it is scarcely necessary to notice that the instrument called the saw, does not itself cut the stone, but the hard silicious sand which is kept in the incision, is, by the pressure of the edge of the "saw," made to rub away the stone by friction. This mode of sawing *hard* stone has, we believe, been practiced from time immemorial, and no improvement upon the principle has yet been discovered. In the patented improvements for sawing stone, introduced by the patentee (James Tulloch, Esq., of Savage Gardens), the sand and toothless saw are still adhered to; the improvements relating to the application of some judiciously contrived machinery, which is to be actuated by a steam engine, or other motive power.

a is a block of stone, *b* the side view of a frame, in which it may be supposed several saws are fixed parallel to each other in a horizontal line, for the purpose of making as many incisions in the stone as there are saws. The ends of this frame *b*, are formed on the under side into inclined planes, which run upon two anti-friction rollers *c c*; so that when motion is given to the saw, each end of the frame is alternately lifted up, to allow the water and sand to descend into the fissure. The anti-friction rollers are attached to two slides *d d*, placed in grooves in the two upright posts; the slides, with their rollers, are suspended by two chains *e e*, which are wound round two barrels *f f*, on the shaft *g*: this shaft turns in bearings, as shewn, and carries, besides the two barrels *f f*, another barrel *k*, and a large pulley wheel *h*; to the latter is suspended a weight *i*, as a counter-balance to the saw frame; and the chain round the barrel *k*, is attached at the other end to a sliding piece, on the vibrating beam *l*. The use of these several barrels, or wheels, on the shaft *g*, is merely to support the chief part of the weight of the saw frame, and to allow of its regular descent as the saws proceed in dividing the stone into slabs.

The gear, on the right hand of the engraving, is for giving a regular motion to the saw frame. The power of a first mover being applied to the toothed wheel *m*, it actuates the two smaller wheels *n n*, to the shafts of which are fixed cranks, which, as they revolve, give motion to the vibrating bar *l*, by means of the rods *o o*. The vibration of *l* gives an alternating motion to the saws in the frame *b*, while the several pullies to which the saw frame is suspended, admit of its descension regularly, and with aa uniform pressure: the weight of the saws should always predominate over the counter-balance, that they may act with proper effect upon the stone.

The patentee also proposes to apply this apparatus in the making of grooves, mouldings, cornices, pilasters &c. of marble and other stone, by means of properly indented instruments, which are to traverse the face of the stone, suspended in a frame, by the means beforementioned. By suspending the saws in the manner described, it is presumed, a great advantage is gained, as they may thereby be kept in a perfectly horizontal line, so that the face of the stone may be acted upon uniformly in all its parts, and the hardest parts be reduced equally with the softest.

History of the Steam Engine.

CHAPTER II. (*continued.*)

Contents.—WATT'S EXPERIMENTS.—GAINSBOROUGH'S CLAIMS TO WATT'S INVENTION.

We now come to the most important era in our history: that in which James Watt commenced his invaluable exertions in the improvement of the Steam Engine. It is not in our plan to give biographical sketches of the inventors who come under our notice; but as the beginning and progress of Watt's career form some of the principal events of his life, our history must here assume somewhat of this character.

James Watt was born in Greenock, in the year 1736. He was, at the age of 16, apprenticed to a mathematical instrument maker. This business, it

appears, differed materially from what we now understand by the term, consisting of land-surveying, repairing clocks, almost every kind of musical instruments, fishing tackle, and cutlery. In the year 1757 he was appointed mathematical instrument maker to the University of Glasgow, and apartments were given him in the college, in which he lived and transacted his business.

It appears that at this period the college of Glasgow possessed apparatus and funds by which they were enabled to contribute largely to the general diffusion of useful knowledge among that class of individuals to whom it was peculiarly beneficial. This was one among the many advantages which arose from the establishment, but the greatest was that of exciting the attention, and drawing forth the energies of young Watt. We shall give the particulars of the commencement of his career in his own words, being satisfied that we cannot exceed them either in simplicity or effect.

—" My attention," says he, " was first directed in 1759, to the subject of steam engines, by Dr. Robison, then a student in the University of Glasgow, and nearly of my own age. Robison at that time threw out the idea of applying the power of the steam engine to the moving of wheel carriages, and to other purposes; but the scheme was not matured, and was soon abandoned on his going abroad."

" In 1761 or 1762 I made some experiments on the force of steam in a Papin's digester, and formed a species of steam engine, by fixing upon it a syringe one third of an inch in diameter, with a solid piston, and furnished also with a cock to admit the steam from the digester, or shut it off at pleasure, as well as to open a communication from the inside of the syringe to the open air, by which the steam contained in the syringe might escape. When the communication between the cylinder and digester was opened, the steam entered the syringe, and, by its action upon the piston, raised a considerable weight (15 lbs.) with which it was loaded. When this was raised as high as was thought proper, the communication with the digester was shut, and that with the atmosphere opened; the steam then made its escape, and the weight descended. The operations were repeated; and (though in this experiment the cock was turned by hand) it was easy to see how it could be done by the machine itself, and to make it work with perfect regularity. But I soon relinquished the idea of constructing an engine upon this principle, from being sensible it would be liable to some of the objections against Savery's engine; from the danger of bursting the boiler, and the difficulty of making the joints tight; and also that a great part of the power of the steam would be lost, because no vacuum was formed to assist the descent of the piston.*

The attention necessary to his business of a mathematical instrument maker prevented him from prosecuting the subject any further at this time. But in the year of 1763-4, having occasion to repair a model of Newcomen's engine, belonging to the Natural Philosophy Class of the University, his mind was again directed to the subject." At that period his knowledge was derived principally from Desaguliers, and partly from Belidor. He set about repairing the model *as a mere mechanician*, and when that was done and set to work, he was surprised that its boiler was not supplied with steam, though apparently quite large enough (the cylinder of the model being two inches in diameter and six inches stroke, and the boiler about nine inches in diameter); by blowing the fire it was made to take a few strokes, but required an enormous quantity of injection-water, though it was very lightly loaded by the column of water in the pump. It soon occurred to him that this was caused by the little cylinder exposing a greater surface to condense the steam than the cylinders of larger engines did, in proportion to their respective contents; and it was found that by shortening the column of water, the boiler could supply the cylinder with steam, and the engine would work regularly with a moderate quantity of injection. It now appeared that the cylinders being of brass would conduct heat much better than the cast iron cylinders of larger engines (which were generally lined with a strong crust), and that considerable advantage could be gained by making the cylinders of some substance that would receive and give out heat the

* The reasons here given by the historian will appear, to modern mechanics, very futile and insufficient. It is now a matter of *no* " difficulty to make the joints tight"; and high-pressure steam, it is well known, is more economical than that at which Mr. Watt worked his engines.

slowest.* A small cylinder of six inches diameter and twelve inches stroke, was constructed of wood, previously soaked in linseed oil, and baked to dryness. Some experiments were made with it; but it was found that cylinders of wood were not at all likely to prove durable, and that the steam which was condensed in filling it still exceeded the proportion of that which was required in engines of larger dimensions. It was also ascertained, that unless the temperature of the cylinder itself were reduced as low as that of the vacuum, it would produce vapour of a temperature sufficient to resist part of the pressure of the atmosphere. All attempts, therefore, to reduce by a better exhaustion, by throwing in a greater quantity of injection water, was a waste of steam, for the larger quantities of injection cooled the cylinder so much, as to require quantities of steam to heat it again, out of proportion to the power gained by having made a more perfect vacuum; and on this account the old engineers acted wisely in loading the engine with only six or seven pounds weight on each square inch of the piston."

It appears by Dr. Ure, that Watt tried some experiments regarding the latent heat of steam, of which the Doctor gives the following account:—" In some conversations with which this great ornament and benefactor of his country honoured me a short period before his death, he described, with delightful *naivete*, the simple but decisive experiments by which he discovered the latent heat of steam. His means and leisure not then permitting an expensive and complete apparatus, he used apothecaries' phials: with these he ascertained the two main facts, first, that a cubic inch of water would form about a cubic foot of ordinary steam, or 1728 inches; and that the condensation of that quantity of steam would heat six cubic inches of water, from the atmospheric pressure to the boiling point. Hence he saw that six times the difference of temperature, or fully 800° of heat, had been employed in giving elasticity to steam, and which must be all subtracted before a complete vacuum could be obtained under the piston of a steam engine."

The great experimentalist deserves as much praise for these experiments as for any thing he ever effected. Upon the facts developed in this enquiry he built up the theory which shall carry his name to posterity. Although he modestly ascribes his discovery to Dr. Black's explanation of his *theory of latent heat*, there can be no doubt that these experiments were more decisive and useful than any theoretical explanation could possibly be.

He found, therefore, that his first business was to keep the cylinder as hot as possible, and that to obtain a tolerable vacuum, the temperature of the condensed steam should be at most 100°, and less if possible. Various were the means which were contemplated to effect these ends, when, early in 1765, it struck him, " *that if a communication were opened between a cylinder containing steam, and another vessel which was exhausted of air and other fluids, the steam, as an expansible fluid, would immediately rush into the empty vessel, and continue to do so until it had established an equilibrium; and if that vessel were kept very cool, by an injection or otherwise, more steam would continue to enter until the whole was condensed.*"

So far we have the invention complete; but still the condensed water and *incondensible* steam were not disposed of, and how to rid the condenser of these was long a matter of difficulty. The water, indeed, could be allowed to run off, by having a pipe whose length would exceed that of a column of water equivalent to the pressure of the atmosphere, but the air was not removed. At last it occurred to him that a pump would draw off both air and water, and preserve a perfect vacuum in the condenser.

Thus was completed one of the greatest inventions ever known. By the simple operation of thought, in a few days was effected that which had hitherto been deemed an impossibility—*a hot cylinder and a perfect vacuum.*

We should act unfairly if we concealed that Mr. Watt has been denied, by some men of great respectability, the merit of discovering the separate condenser. Hornblower says, " It occurred to Mr. Gainsborough, the pastor

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* The inventor was right in proposing to use some material which would receive and give out heat the slowest, but greatly in error when he supposed *polished surfaces* would conduct heat quicker than rough ones. It has been repeatedly proved, that rough surfaces are best adapted to give out or receive heat, the unevenness of the surfaces acting like an immense number of conductors to and from the metal.

of a dissenting congregation at Henley on Thames, and brother to the painter of that name, that it would be a great improvement to condense the steam in a vessel distinct from the cylinder where the vacuum was formed; and he undertook a set of experiments to apply the principle he had established, which he did, by placing a small vessel by the side of the cylinder, which was to receive just so much steam from the boiler as would discharge the air and condensing water, in the same manner as was the practice from the cylinder itself in the Newcomenian method, that is, by the shifting valve and sinking pipe. In this manner he used no more steam than was just necessary for that particular purpose. The circumstances as here related, receive some confirmation, by a declaration of Mr. Gainsborough, the painter, to Mr. J. More, late secretary to the Society of Arts, who gave the writer of this article the information. Whether he clothed the cylinder as Mr. Watt does is uncertain: but his model succeeded so well, as to induce some of the Cornish adventurers to send their engineers to examine it; and their report was so favourable as to induce an intention of adopting it. This, however, was soon after Mr. Watt had his Act of Parliament passed for the extension of his term; and he had at the same time made proposals to the Cornish gentlemen to send his engine into that country. This necessarily brought on a competition, in which Mr. Watt succeeded: but it was asserted by Mr. Gainsborough, that the mode of condensing out of the cylinder was communicated to Mr. Watt by the officious folly of an acquaintance, who was fully informed of what Mr. Gainsborough had in hand."

At this date it is impossible to decide the merits of their respective claims. It does not appear that much credence has been given to the statement of Hornblower by recent writers, but we certainly consider that it throws considerable doubt upon the matter. We by no means think with Dr. Brewster that Hornblower's ignorance of these circumstances, when examined before the House of Commons, precluded the possibility of his knowing them afterwards. But there is so much detraction where there is merit, that we sincerely hope this solitary testimony is dubious, especially when we consider that Mr. Hornblower was a rival of Watt during the whole of his career.

It should likewise be observed, that the addition of a pump to the condenser is never disputed to be the invention of Watt, and this is essential to its utility. One only instance have we known of a condenser without an air-pump, and the engine went very irregularly.

[*To be continued.*]

London Mechanics' Institution,

WEDNESDAY, 3rd of MAY, 1826.

MR. WALLIS'S FIFTH LECTURE ON ASTRONOMY.

REFRACTION AND ABERRATION OF LIGHT. HORIZONTAL MAGNITUDE OF CELESTIAL OBJECTS. PARALLAX. TRANSIT OF VENUS. PHENOMENA OF THE SUN.

On Wednesday evening Mr. Wallis delivered the Fifth Lecture of his admirable course on Astronomy. He commenced by observing, that there yet remained another phenomenon relative to our planet which he had not referred to. To the height of 40, 50, or 60 miles, we are surrounded by a transparent medium called the Atmosphere. Now it is a law in optics, that when a ray of light passes out of one *medium* into another, it is turned out of its course according as it falls more or less *obliquely* on the *refracting* surface which divides the two mediums. The natural course of a ray of light, when passing through a medium of equal density, is in an horizontal or straight line; but when it is diverted by meeting a different medium, it forms a line concave towards the earth. A ray of light is not, however, refracted, when it falls perpendicularly upon a medium. As an illustration of light being refracted in passing from one medium into another of greater density, he

would instance its passing out of air into water. If a stick is put obliquely into water, it appears broken at an angle. This is in consequence of the rays passing out of a light into a heavy medium, the water being about 800 times more dense than the atmosphere. It should, however, be stated, the rays of light do not enter at once into the most dense medium of our atmosphere. The air diminishes in density upwards: thus, at a distance of about 3½ miles it is only half as dense as we have it here. This was ascertained by the fact, that balloons cannot get beyond a certain altitude. It had been ascertained also, through their agency, that if at the height of 3 or 4 miles, which is about the greatest they can attain, a vessel is corked down, though of course it is at that time full of atmospheric air, on again reaching the earth it will be found not to be more than half full. This phenomenon is one more that may be referred to the law of gravitation, which will satisfactorily explain it. The pressure of the atmosphere is about 15lb. on the square inch, which decreasing in a geometrical ratio, it follows that the rays of light are not immediately refracted in an angle, and describe, therefore, a curve.

Mr. Wallis here introduced a diagram, which showed the earth surrounded by its atmosphere and the sun. He explained that the refraction of the sun's rays would cause the latter to appear above the horizon 5 or 6 minutes before it really was. This was accounted for by its being stated, that all objects are referred to the direction in which the rays proceeding from them strike the eye. The sun's rays being refracted, therefore, when they pass through the denser medium of our atmosphere, strike the eye in horizontal lines, and, imagining we see the object, we conclude the sun has risen some minutes before in truth he has. As we see the sun, then, 5 or 6 minutes before he is above the horizon in the morning, and 5 or 6 minutes after he has sunk below it in the evening, it follows that our days are lengthened by the refraction of his rays as much as 10 or 12 minutes.

As a further explanation of his statement, that all objects are referred to the direction in which the rays strike the eye, he pointed out, that the sun or moon, or any other object, is not in reality seen through a telescope, but that taken for it is, in fact, only the reflection on the lens. The sun's rays being retained later and received earlier, was of great importance in very high latitudes. At the North Pole, for instance, it gave the additional light of some weeks, both at the period of the sun's rising above the horizon, and of his sinking below it.

Another of the phenomena resulting from the same cause was twilight. This was produced partly by the *refraction* of the sun's rays, and partly by *reflection*. Were it not for this the transitions from night to day, and from day to night, would be so sudden, that we should be blinded by them. The rays of light, but for this, would come to us in straight lines, and the appearance and disappearance of the sun would be instantaneous. The change would be from the brightest sunshine to the most absolute darkness, the profundity of which would be in turn as suddenly dispelled by an inconceivable blaze of light.

What a beautiful connexion was there not seen between the construction of the eye, and this order of twilight! The pupil of the eye required time to dilate or contract, that it might accommodate itself to the quantity of light which struck it, and this was afforded by the gradual change which took place. That the pupil of the eye did dilate and contract, might be evidenced by a very simple experiment which he would mention, that those who took sufficient interest in the subject might try it. If they pressed their hands some time before their eyes, and immediately afterwards looked in a glass, they would observe the pupils had dilated, and would gradually contract to avoid taking in too much light.

Mr. Wallis then proceeded to explain that in all astronomical calculations it was necessary to make allowance for the refraction of the sun's rays. The parallax, which had been described in a previous lecture, depressed the sun, and reflection elevated it.

A diagram was then exhibited, to shew that light was material and had motion. It was observed, that the occultations of Jupiter, as described in tables formerly taken, did not agree with recent observations; sometimes the fact anticipated the tables, and at others the tables anticipated the fact.

The difference was found to be eight minutes, and it was at last ascertained, that it resulted from the earth's being in that part of its orbit which was at the greatest distance from the planet. Hence it was discovered, that light actually traversed the distance of the earth's orbit in eight minutes of time. "Thus," observed Mr. Wallis, "it is seen, that a due attention to what might appear a trifling difference in the tables, brought out the fact, that light travels at the rate of about 200,000 miles in every second of time:" he mentioned this, but the velocity was too great to be conceived. Light, then, was a material matter, so attenuated that the eye alone was sensible of its presence. Another proof of its being material was, that some bodies attracted it more than others, and it should be considered, that it was impossible to conceive motion, without concluding that that which moved was material.

Mr. Wallis then said there was another fact connected with the aberration of light, which was most interesting to astronomers, because it afforded the most conclusive proof that the earth moved round the sun and not the sun round the earth as some earlier systems assumed. Dr. Bradley was making some observations respecting the parallax of a fixed star (γ in the head of Draco we believe) and repeating them from time to time. On one of these occasions he observed the star had changed its former situation, and his not being able to account for this, led him accidentally to the discovery, that it proceeded from the progressive motion of light and the earth's revolution in its orbit. If light is propagated in time, the place of a fixed object cannot appear to be the same when the eye is in motion as when it has remained at rest. This was fully explained by the worthy lecturer, who made it evident, that though the real situation of an object be perpendicular to the line in which the eye is moving, yet its visible place must be in the telescope's direction, through which the object is witnessed. The difference then between the real and apparent place, will accord with the velocity of the light, and the motion of the eye. Mr. Wallis observed, when these nice calculations were considered, there could not exist any surprise that, in the construction of almanacks, slight errors were occasionally committed.

Mr. Wallis said there was another phenomenon connected with the atmosphere, but it could not be satisfactorily accounted for. The sun or moon, when near the horizon, appeared of greater magnitude then when seen near the zenith. Notwithstanding this appearance, however, if they were measured by a telescope there was no difference found, they subtended the same angle. This phenomenon did not apply to the sun and moon merely, but extended to the stars and planets and the intervals of space between them. *Ursa Major* was near the horizon during the winter, and this constellation appeared at that period twice or three times larger than when seen during the summer nearer the zenith. Mr. Wallis then exhibited a diagram and proceeded to point out the contradictions in the theory of Dr. Smith, who had endeavoured to solve the difficulty.

Mr. Wallis then proceeded to explain the precession of the Equinoxes. Referring to *centrifugal* force, he observed that *tangential* was a word that would better describe it; for if a stone were whirled round in a sling and suddenly allowed to escape, it would fly off at a tangent to the curve. Mr. Wallis exhibited several beautiful and simple mechanical contrivances which practically demonstrated the operation of those combined forces, from which results the precession of the Equinoxes. It was shown how the equator cuts the ecliptic at every part in succession during the earth's revolution.

Mr. Wallis then explained the nature of the transit of Venus; and observed, by the assistance of a diagram, that the time this planet took in passing over the sun's disc, as observed at different parts of the globe being ascertained, they were enabled to find the earth's distance from the sun. The last transit of Venus was in 1769, there will not be another till 1875. Mr. Wallis applied these principles to the solar system generally: but the limits of our publication will not allow us to follow him.

The worthy lecturer concluded by referring to the sun. A transparency was exhibited, shewing his disc to be *mottled*. There were black spots occasionally seen. He revolved on an angle of 88° from the plane of the ecliptic, and on his axis in 27½ degrees. The spots sometimes looked like straight lines, very thin, curving sometimes upwards and at others downwards. The

spots changing into lines, proved he was a globe and revolved. Frequent instances occur of light without heat, and heat without light. The moon would instance the first, and iron, hot though not red, the second. The sun was rather supposed to be the cause of heat, than a body from which it proceeded. If its rays were *caloretic* and proceed from his surface, more must be emitted than could be absorbed.

Admitting that theory, though from the laws which regulate other planets being very similar to our own, we might infer that they are inhabited by intelligent beings, we must cease to think so, for we cannot suppose they could endure either the heat of Mercury or Venus, or the cold of the more distant planets. It would, therefore, be more rational to suppose the sun the *cause* of heat, his rays producing it by some unknown chemical combination with the different atmospheres. We could then suppose the extremes of heat and cold, which would be otherwise felt by the other planets, somewhat modified.

Mr. Wallis concluded his Lecture amidst great applause. In the next Lecture he intends treating on the Sidereal System of the Universe.

LIST OF NEW PATENTS.

COOKING APPARATUS.—To John Bellingham, Norfolk Street, Strand, for improvements in the construction of cooking apparatus.—18th April, 2 Months.

WEARING APPAREL.—To James Rowbotham, of Blackfriars' Road, and Robert Lloyd, of 70, Strand, for preparing a certain material for the making of hats, bonnets, cloaks, and wearing apparel in general, and various other purposes,—18th April, Six months.

LIST OF EXPIRED PATENTS.

It having been suggested to us by an intelligent correspondent, that it would be very useful and important information to our readers, were we to give, in addition to our usual list of new patents, a regular list of all those in which the usual grant of 14 years had expired, in order that it might generally be made known, that such patented discoveries and inventions were no longer restricted to the patentees, but were open to the free use and adoption of the public at large. Entertaining the same opinion as to the utility of publishing such a list, we commence in the present Number to publish an account of those that expired in the month of April last, and shall continue to give similar monthly lists in our succeeding Volumes.

ISINGLASS.—To J. R. Drake, of Baldwin Court, Cloak Lane, London, for a method of preparing the various sorts of isinglass, such as book leaf, long staple, and short staple, and also cake isinglass from river or marine fish. Expired April 8th, 1826.

STEELYARD.—To Mr. Whitfield, of Birmingham, for a one side compound lever steel yard.—Expired April 15th, 1826.

ROASTING MACHINE. To John Ashley, of Homerton, Middlesex, for an "horizontal vertical moving roaster." Expired April 15th, 1826.

PIN MAKING.—To John Leigh Bradbury, and Charles Weaver, of Gloucester, for a machine for heading pins. Expired April 15th, 1826.

SHIPS' HEARTHS.—To Charles Fly Blant, of Prujean Square, Old Bailey, London, for an improved ships' fire hearth, and for other useful purposes.—Expired April 21st, 1826.

OIL LAMPS.—To Graham Chappell, of Arnold, Nottinghamshire, for an oil lamp, of a peculiar construction, combining more advantages than any other previously used. Expired April 28th, 1826.

CHRONOMETER.—To Edward Massey, of Cross Heath, near Newcastle-under-line, Staffordshire, for an improved chronometer. Expired April 30th, 1826.

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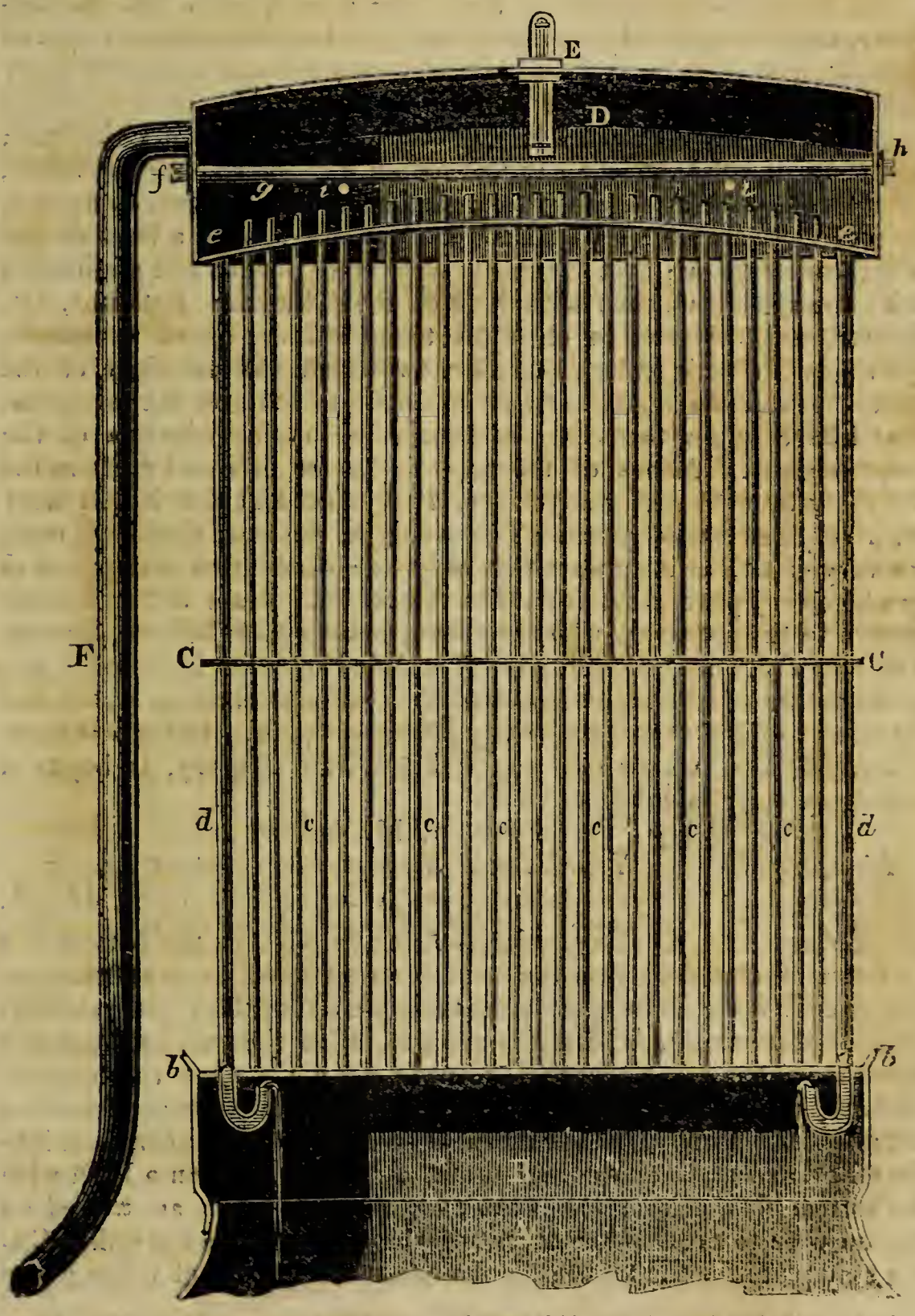
CONTENTS:

Grimble's Patent Distilling Apparatus, 370—London Gymnastic Society, 371—New Thrashing Machine, ib.—A Canal Digging Machine, ib.—History of the Steam Engine, Chap II. concluded, 373—Silk Trade, 375—Thomas Masterman's Patent Apparatus for Bottling Liquors, 376—John Masterman's Patent Machine for Corking Bottles, 377—London Mechanics' Institution, Mr. Wallis's Sixth Lecture on Astronomy, 381—Correspondents, &c.



GRIMBLE'S PATENT DISTILLING APPARATUS,

In Use at Messrs. Booth's Distillery, Cow Cross Street, London.

GRIMBLE'S PATENT DISTILLING APPARATUS.

To the Editor.

SIR,

As your pages are open to the promulgation of science in every variety, allow me, a constant reader, to solicit a notice in your valuable magazine, of Grimble's Patent Distillery Apparatus, which for its extreme simplicity, surpasses in effect all the complicated improvements that have been introduced in the distillery plant for many years. I have been favoured with a sight of the apparatus at work attached to a still of 200 gallons, and I was very much pleased with its performance; from what I could learn from the distiller, who was perfectly conversant with the improvement, it required less attendance than stills with the common head, and was under more control, as in case of running too fast, it could be instantly checked; that it required a less quantity of coals to work the still; and that the whole charge was worked off without making any feints, or bringing over any of the gross oils, near 60 per cent. overproof, in much less time than a still of the same size, with a head of the usual construction; that the spirits were more pure at one distillation with the apparatus, than with three on the old mode. I am not, Mr. Editor, much versed in chemical technicalities, or of substances parting with their caloric, &c. &c. on which the principle of the patentee seems founded; but I am so much pleased with the invention, that I have taken this mode of expressing my approbation of the improvement. Aware of the great saving in time and coals in the distillery by not making any feints, I feel confident that it will meet with very general adoption. The saving in the malt distillery must be very great, as it appears that only one distillation is required to produce very pure spirit from the raw wash. I am not personally known to the patentee, who, I believe, resides with Messrs. Booths, and who are, I understand, so well satisfied with the importance and great saving of the invention, that they are now erecting a still and apparatus of 5,000 gallons on the patentee's plan. Being a little of a draughtsman, I have sent you a sketch from memory, in hopes of seeing an early insertion of which.

London, I remain, Mr. Editor,
May, 1826. Your humble Servant, and constant Reader,
A RETIRED DISTILLER.

Reference to the Engraving.—A is the still, B the bottom box of the apparatus fitting on the still, *b b* a plate of copper fitting on the box B, *c c c c* are open tubes through which the vapour ascends into the top box D, where the separation of the spirits from the aqueous vapour takes place; the tubes *c c c c* project through the bottom plate of the box D, so that the oily and aqueous matters are not allowed to impede the fresh vapour from the still, but run back into the still down the larger corner tubes, *d d*, which are on a level with the bottom plate at *e e*; the lower ends of these tubes are turned up syphon-wise to prevent the ascent of the vapour from the still; C C is a stay-plate for the tubes; in the box B is a range of tubes *g g g*

through which a jet of cold water is passed when the spirit is required very strong (but not generally used), having its egress and exit at *f h*; F is the pipe that conveys the spirituous vapour into the worm tube. The whole operation appears to be governed by the thermometer E, and the great purity of the spirit obtained in this way must be obvious to every one."

LONDON GYMNASTIC SOCIETY.

WITH Scientific and Literary men it has been a frequent subject of regret, that the ruin of the ancient states of Greece and Rome should have involved in obscurity the arts by which they increased the muscular power of their citizens to an extent capable of enabling them to perform feats of strength and valour never since equalled. It seems strange, that, strongly as this feeling has been generally expressed, no attempt should have been made, until within a few years, to introduce the practice of any regular system, by which even a portion of the good effects formerly derived might be expected to result. On the continent, however, some spirited individuals have made the experiment with considerable success; and it is now our duty to record, that a society under the above title has commenced its meetings under very favourable auspices. We have additional pleasure in making this communication, because, of late years, the growth of our manufactures, and the great increase of commercial pursuits, together with the necessity consequent upon these, of congregating large masses of our population in confined habitations, have rendered the adoption of some species of bodily exercise, with a view to the promotion of health, a matter of the first consequence.

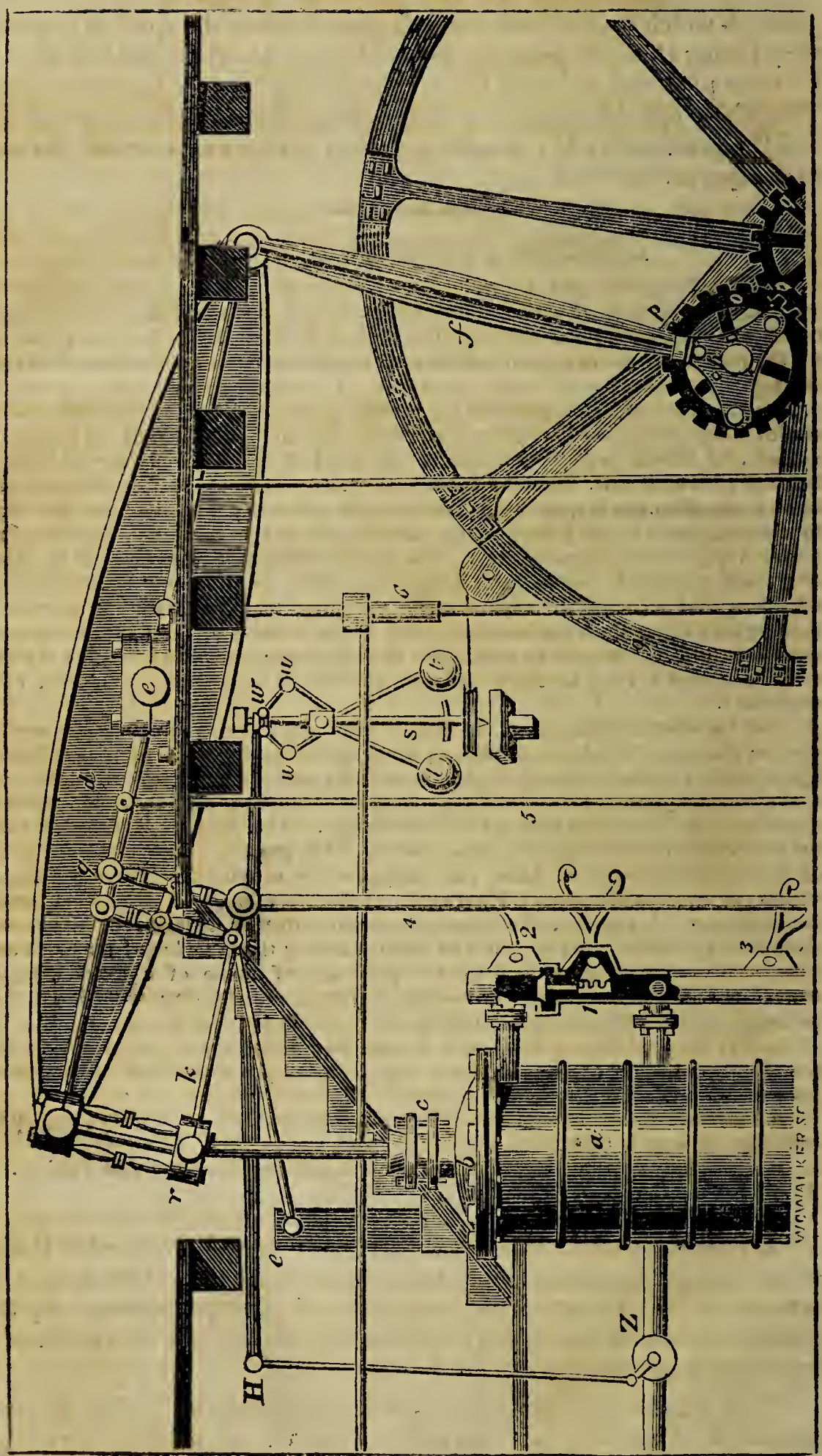
On Tuesday morning last, the members of the Society in question, assembled to the number of about 200, at their ground near the New River Head, Spa Fields, for the purpose of commencing their preliminary exercises. As early as six o'clock Drs. Gilchrist, Black, Professor Voëlker, &c. were in attendance to afford the necessary instruction. The ground, which had been formerly laid out as a garden, was covered with gravel, and in different parts of it, a variety of poles, bars, and masts, were erected for the performance of the required evolutions. Having formed into classes of ten each, under the guidance of leaders, the members went through a series of exercises, contrived principally with a view to strengthening the muscles of the arms and legs, in order to prepare them for the practice of those of a more difficult character. These consisted of continual jumping, running with the hands pressing on the hips, raising the body on parallel bars by the strength of the arms, &c. &c. After an hour and a half had been spent in this way the meeting broke up; the different members expressing themselves much pleased with their morning's exertion.

A considerable number of visitors had assembled to witness the proceedings, and were admitted into the ground.

The mornings of meeting, as at present fixed, are Tuesday and Friday.

A Canal digging Machine, has lately been introduced at Paris, which is capable of excavating the earth to the depth of 10 feet, and extract, and carry out of the canal 96 cubic feet per minute, by the application of a power equal to 8 horses; it digs out a breadth of 8 feet at each stroke.

New Thrashing Machine.—A Farmer upon the Wallop Estate, parish of Westbury, has invented a small, or as it is termed a *portable* thrashing machine, which makes 300 strokes per minute by the power of one man, and in the most effectual manner.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History of the Steam Engine.

CHAPTER II. (*concluded.*)

Contents.—CYLINDER OF WATT'S ENGINE.—SUN AND PLANET MOTION.—PARALLEL MOTION.—GOVERNOR.—CONDENSER.—WATT'S EXPERIMENTAL ENGINE.—COUNTER.—ADDITION OF THE CRANK AND SUBSTITUTION OF THE SUN AND PLANET MOTION.

THE drawing before us represents Watt's engine, with nearly all his improvements, and exhibits it in a state of perfection to which it was only brought at a late period of his life. It serves our purpose better to explain his successive alterations and additions in this way, than to give separate and unconnected diagrams, which would but convey to our readers an obscure and indefinite idea of their arrangement. We shall first proceed to explain the principle of this machine, and afterwards detail the dates of the improvements as they were added.

Our readers must suppose the cylinder, *a*, to resemble that of Newcomen's engine, excepting that it is more accurately bored, so that it may be perfectly cylindrical throughout.* It is fitted with a lid or covering at top and bottom instead of being left open at top as in the old engine. In the centre of the upper covering is a hole, through which the piston rod passes; on this lid is the stuffing box, *c*, the lower part of which consists of a hoop or cavity, with a flanch and screw holes. The interior of the cavity is large enough to admit some soft vegetable substance (hemp or cotton) to surround the piston rod, which is likewise accurately turned. The covering or upper part of the stuffing box is less than the interior of the cavity in which the stuffing is lodged; when, therefore, the screws are tightened the upper part presses the stuffing close to the piston rod, and prevents the escape of the steam.† *d* is the beam made of cast iron. It rests upon the centre, *e*, and is connected at the further end by the connecting rod, *f*, to the fly wheel, *g*, the axis of which drives the machinery. The mode by which the revolution of the fly wheel is effected is by what is called a *sun* and *planet* motion, and may be thus explained:—*h* is a toothed wheel, bolted on to the connecting rod, so that it cannot revolve upon its axis. *o* is likewise a toothed wheel fixed to the fly wheel axis so that they cannot revolve but in conjunction. The centres of the two wheels are connected by a bar so that the centre of the wheel, *h*, describes a circle, of which the fly wheel axis is the centre. The fly wheel, in this instance, makes a revolution at each stroke of the piston, differing essentially from the common crank, which makes but one revolution for two strokes of the piston. The latter may be compared to a man turning an axle by a handle, whilst the former is like the same axle turned by a wheel, *fixed* upon the handle. The principle will be better understood by reference to our drawing.

Let us suppose the connecting rod to be descending. At present the points, *o o*, are in contact; but, when the connecting rod has descended to the lowest part of its circle, the points, *p p*, it will be clearly seen are in contact; and before this can have taken place, the point, *p*, on that wheel which revolves with the fly wheel, must have performed half a revolution, otherwise it cannot be in contact with *p* of the wheel which is immediately below the axle of the fly wheel.

k e m is the parallel motion. The purpose of this is to keep the top of the piston rod parallel whilst the end of the beam describes a segment of a

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* This required a degree of perfection in the art of boring which had not been attained previous to the time of Watt. The method hitherto adopted had been to depend upon the accuracy of the casting for the guidance of the cutter, and as this was either frequently untrue, or in some parts softer than in others, the boring varied from the true cylinder when either of these mischances arose. The improved method obviated these objections by fixing the cutter block firmly upon a cylindrical bar, and causing the cylinder to revolve after it had been accurately chucked, and the cutter block was propelled the length of the cylinder by a screw in the interior of the bar.

† Watt proposed to use leather for stuffing. This, it is well known, would be speedily destroyed by heat. Hornblower made the blunder of his great rival a constant theme of his wit, and so far did he carry his disposition to laugh at Watt, that in his own patent he said, "*The stuffing box would be filled with some soft substance, but not leather.*"

circle. It is not mathematically correct, but so nearly, that in practice its inaccuracy cannot be detected. The rod, *e m*, describes a segment, and there is a point (*q*) in the beam which forms a corresponding segment; when, therefore, a bar or rod is fixed by joints on two centres, *q m*, it is found that there is a point in that bar which preserves a motion nearly parallel during the ascent or descent of the beam. This parallelism is transmitted to *r*, the part where the beam and piston rod are connected, by which means that also is kept perfectly perpendicular.

The governor or pendulum, *s*, is used for regulating the quantity of steam admitted into the cylinder, and may be easily understood. The balls are heavy, and rise or fall according to the speed. When the engine goes too quickly, they also revolve with equal rapidity; and in doing so, the balls, from their centrifugal force being increased, recede from the centre, and thereby raise the levers by which they are suspended; these levers are connected with the shorter ones, *u u*, which, in expanding, cause the ring or strap, *w*, to descend. Into a groove of this ring a fork or semicircle is made to fit, which is fixed to the end of the lever, *w* H, so that as much as the strap ascends the further end of the lever descends, and by the rod, H Z, depresses the handle of the throttle valve, Z, which is a vane in the interior of the steam pipe, of such dimensions as to completely fill the pipe in one position, and by presenting its edge to the steam in another, to oppose no resistance to the entrance of the steam.

We must now return to the cylinder and condenser, the latter of which is not shewn, but may be briefly described. It consists of a tube immersed in cold water, and connected at the bottom by a pipe to a pump, which is worked by the rod, 4. The use of this pump is to preserve the vacuum by drawing off uncondensed vapour and the water of injection. It acts precisely on the same principle as the common air pump, and bears the same name, the receiver being the condenser, and the pump similar in both. We will now suppose steam admitted from the cylinder: a valve, called the *blowing valve*, is opened, which permits the steam to enter the cylinder and condenser, and drive out the air. When the air is expelled, which may be known by the crackling noise and ebullition which takes place in the water, (the former arising from the globules of pure steam rapidly condensing, and the water thereby collapsing), the blowing valve is shut, and the valves arranged so that the steam can enter the upper part of the cylinder. The steam acting in conjunction with the vacuum now formed on the lower side of the piston causes it to descend to the bottom. The lever, 1, is now turned downwards, and shuts that valve, whilst 2, on a pipe behind that which we see, opens a passage to the condenser. The lever, 3, is at the same time opened, admitting the steam under the piston, which consequently ascends. In the act of rising a jet of cold water is admitted into the condenser, which expedites the condensation. There are a number of tappets on the pump rod, 4, which repeat the changing of the valves when the engine is left to itself. The water in the reservoir surrounding the condenser would be soon heated by the steam, but that a pump worked by the rod, 5, keeps a constant supply of cold water from the well. 6 is a small pump, which supplies the boiler with water from the heated water drawn out of the condenser.

Having now explained the mode of operation, we have to state that the first engines were used for pumping water, and for that purpose alone. The first engine, therefore, was like Newcomen's, a single acting one, as its power was only exerted in one direction. It was covered at the top like the double engine, but instead of having the steam and vacuum to aid it in both ascent and descent, the vacuum was only used in the descending stroke of the piston, whilst the ascending one was effected by a heavy weight or counterpoise at the further end of the beam. During the latter operation the steam was admitted by a valve from the *upper* to the *under* side of the piston, and was there used for forming the vacuum below. By this method the air was entirely excluded from the cylinder.

The first engine was of this description: it was erected on the estate of the Duke of Hamilton, at Kenneil, about a mile from Borrowstoness, in Scotland. The cylinder was 18 inches in diameter, "and it was successively altered and improved, until it was brought to considerable perfection." In 1768 and 9 a

patent was procured for the invention; and in conjunction with Dr. Roebuck, (the founder of the Carron Iron Works, and through whose interests the experimental engine had been erected at Kenneil) arrangements were made to manufacture on a large scale, when, from pecuniary embarrassments, the Doctor was obliged to withdraw his promised aid, and Watt was about to abandon his project. It fortunately happened, however, that a negociation was opened with Mr. Matthew Bolton, of Birmingham, which was concluded in 1773.

From this time things went on successfully, his colleague was a man of wealth and influence, and lent his utmost aid to the extension of the sale, which was effected with great difficulty, chiefly arising from the increased cost of erection. The patentees, however, were contented to erect the engines at their own cost, and to receive as rent a third part of the saving of coal, which saving was decided by a machine similar to that now used on Waterloo, Southwark, and Vauxhall bridges. It consisted of a train of wheel work, which was moved at each stroke of the beam, and, of course, it could be easily ascertained how many strokes had been made in a given time.

In the early engines a rack and sector were used for the purpose of working the beam by the piston; but this was very defective, and easily disarranged, especially where the direction was reversed. This gave way to the parallel motion: one of the brightest thoughts which ever occurred to Mr. Watt.

Another difficulty was the irregular motion of the engine, which was subject to considerable variation in speed, as the supply of steam in the boiler varied. This was obviated by the governor acting upon the throttle valve, which, we have already shewn, admitted more or less steam, as the speed decreased or increased. The governor was not Watt's invention, but had been previously used in corn mills, which were subject to similar irregularity. When the stones moved too quickly, the meal, by the rise of the stones, was too coarse, when on the contrary, the motion was slow, the meal produced was small in quantity and too fine. The governor, or as it was then called the *tent-lifter* brought the mill stones nearer when in rapid motion, and removed them further off when slow. This ingenious regulator was applied by Mr. Watt to his throttle valve, and has been ever since used for that purpose.

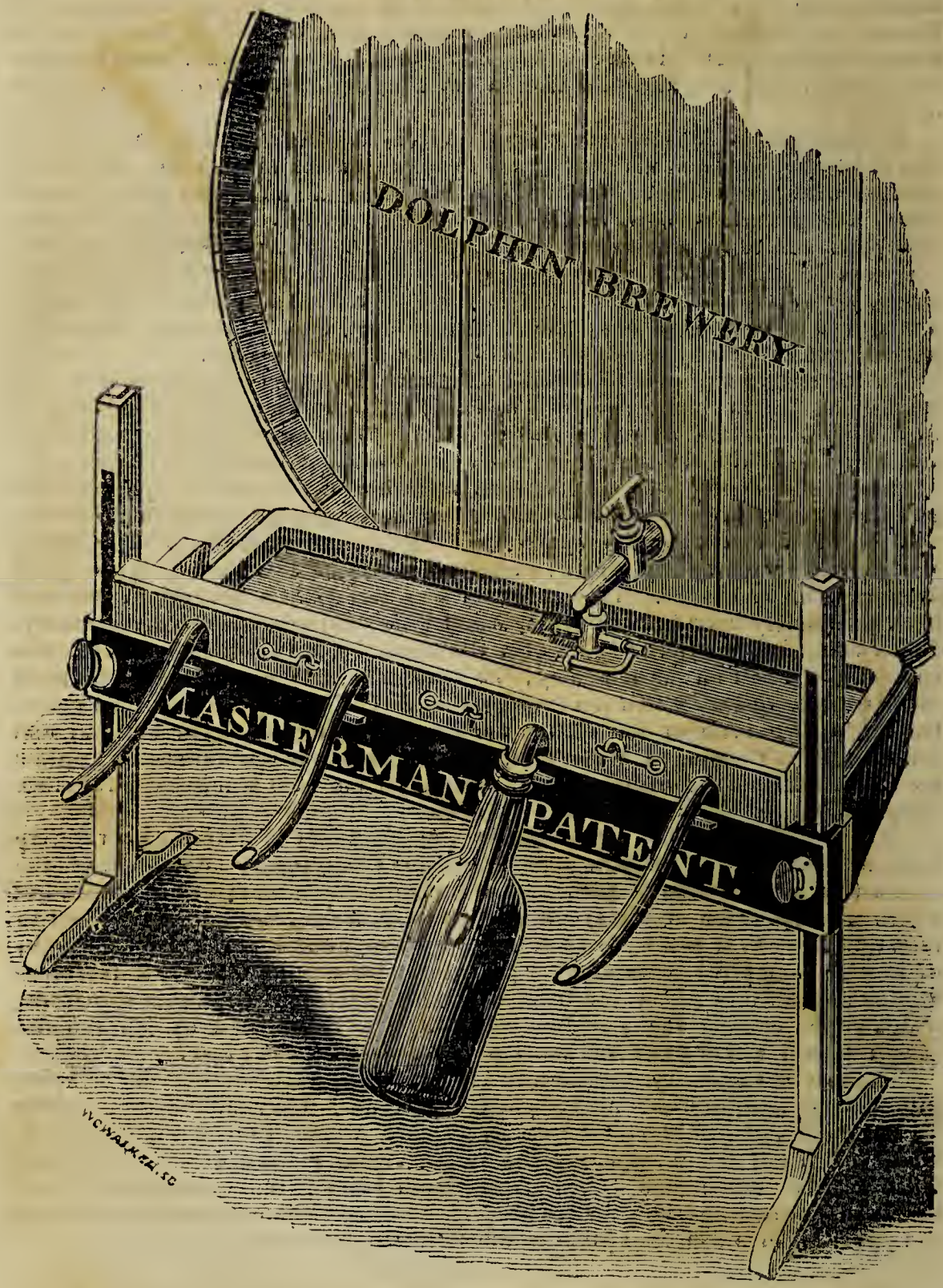
Mr. Watt in 1778, contemplated the practicability of obtaining a rotative motion from the reciprocating one, and for this purpose he thought of the crank (for which we have seen Hulls had previously obtained a patent but which was unknown to Watt) and when he had nearly brought his project to bear and was about taking out a patent for it, he found that a Mr. Wasbrough, of Bristol, had already obtained a patent for the crank, Mr. Watt therefore finding himself thus prevented from using his invention, set about something which might answer the purpose instead. This he effected by his sun and planet wheel, which possesses some advantages over the other.

Thus we have briefly described the successful application and the bringing into general adoption this nearly perfect machine. We conclude this chapter by observing, that although there is scarcely a week passes without a patent being taken out for an improvement in the steam engine, it has undergone little positive amendment. The faults have been little removed by all the talent and industry exerted for the purpose; but these defects and the attempts to remove them we shall explain in the following chapters.

[*To be continued.*]

Silk Trade.—We understand Mr. Fanshawe (who is the patentee of an improved throwing mill) has invented a winding machine on an entire new principle, and which he expects will enable the throwsters of this country to compete in any market with the foreigner. Such an improvement is particularly desirable at this time, the silk trade being in a measure paralysed by the advantage foreigners possess in the cost of labour, but which will be more than counterbalanced by this machine.

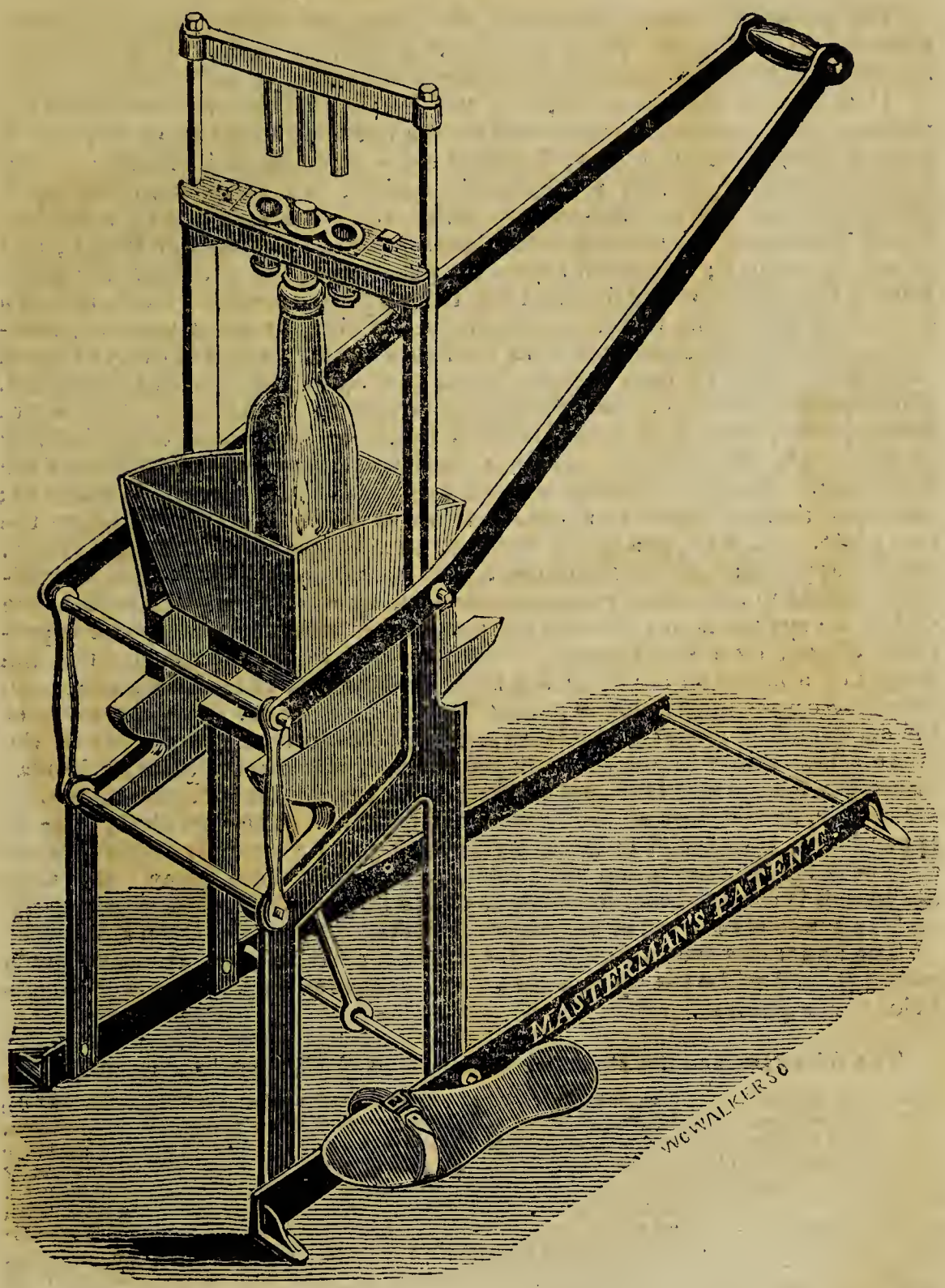
THOMAS MASTERMAN'S PATENT APPARATUS FOR BOTTLING LIQUORS.



In two former numbers (53 and 57) we inserted copies of the specifications of the above inventions, with a few remarks, accompanied by engravings.

Being convinced of their great utility, we felt some surprise that they were not yet before the public for sale; but we now learn that the delay has arisen from the patentees' determination not to offer them until they had satisfied themselves that their construction would not admit of improvement. We have very recently inspected both machines, constructed as they are intended to appear for sale: they both bear evident marks of great ingenuity having been exercised in the adaptation of their several parts; and, to us, they appear perfect

JOHN MASTERMAN'S PATENT MACHINE FOR CORKING BOTTLES.



Understanding that both machines have been used for some time at Messrs. Masterman and Henderson's, Dolphin Brewery, Broad Street, Ratcliffe,* we were desirous to see them in operation, and our favourable impressions are so corroborated by their performances, that we conceive we could hardly do a greater service to our readers, than by presenting them with the two preceding engravings, and by devoting a few of our pages to the subject.

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* The patentees invite the public to inspect them there, or at Mr. John Masterman's, 68, Old Broad Street; or at Mr. Downer's, St. Clement's, Strand. The manufactory is No. 9, Totton Street, Stepney Church-Yard.

A General Description of the Bottling Apparatus,

With reference to the preceding Engraving.

The principle of the invention is, *the filling the bottles, through syphons, from an open vessel, into which the liquor flows from the cask in a stream, so regulated, as always to maintain the liquor in the vessel, at nearly the same level.*

It is evident that the methods by which this level may be maintained are various: the following is preferred by the patentee as the most simple:—A cock is driven into the cask, having a screw wrought on its nozzle; on this a tube is screwed, having a valve in it, similar, in principle and action, to the throttle valve of a steam-engine, which valve is acted upon by a piece of wood, floating on the surface of the liquor, in the open vessel or trough, and nearly covering it; this wood serves the double purpose of a float, for maintaining the surface of the liquor in the trough at the required level, and of a cover, for preserving it from exposure to the air: the latter purpose, however, seems of little consequence, as the liquor in the trough is entirely changed more than twice in each minute, when the apparatus is in full operation. This trough is fixed to a cast metal plate (represented in front). There are four syphons; one leg of each descends nearly to the bottom of the interior of the trough, the other leg (which is the longest) hangs down in front of the iron plate. Across the crown of each syphon a small brass rod is soldered; each end thereof works in a groove made in the wooden frame, above the iron plate. Each syphon is thus hung on an axis, on which it swings freely. On the upper part of the leg in the trough, a piece of lead is cast, of sufficient weight to make that end preponderate, by which means its orifice (the end of the syphon is bevelled for the purpose) is brought against, and is perfectly closed, by a small piece of leather fixed inside the trough; but the weight of a bottle on the outer leg brings *that* nearer to the iron plate, and, of course causes the inner leg to recede from the leather. The extremity of the outer end of each syphon is turned up, so as to form a cup. When the inner orifice comes in contact with the leather, this cup is nearly horizontal. There are four projections cast on the iron plate, for the purpose of holding the bottles, by the rings on their necks, while filling. The iron plate, with its appendages, is fastened to the two grooved legs by a screw, passing through each of those grooves into a nut; and, by means of those screws and nuts, the trough is elevated and depressed, as the height of the cask may require.

The syphons take out of the frame, that they may be kept clean and bright.

The apparatus seems capable of remaining perfect for years, is extremely portable, and will pack up in a case eight inches square, by two feet long.—Price seven guineas.

The following are the Patentees' Directions for Using the Apparatus.

After having driven the cock into the cask, screw on the valve tube, leaving the lever of the valve in a position the farthest from the cask. A washer of leather, of the proper thickness, between the flanches of the cock and the tube, will enable this to be done. Then place the apparatus (with the float in it) under the cock, and in such a position that the valve tube may be directly above the space made for it in the float. Then raise the trough nearly up to the bottom of the cock. The trough is elevated or depressed by means of the screws, through the grooves in the legs. Then open the cock, until the liquor rise in the trough to the orifice of the valve tube, when it must be shut. Then put the end of the valve lever through the eye in the float; and adjust the position of the trough, so as to cause the float to act freely in shutting and opening the valve. Then open the cock, and put the syphons in action, by sucking the air out of them by means of the bent tube; the end with the wash leather being applied to the end of each syphon successively; and hang the bottles on the syphons. It now only remains to adjust the apparatus, so that the bottles may be all filled to the precise point required. For this purpose, change three or four bottles, which will cause the surface of the liquor in the trough to subside to the *working* level; and the last changed will be filled to the point to which all others would be filled. If it should be found too full, elevate the trough,—if not full enough, depress it. The apparatus is then ready for operation.

In hanging an empty bottle on a syphon let the syphon enter its neck as far as it can, then depress the bottle, until its neck (underneath its rings) come in contact with the iron projection. In withdrawing a bottle from a syphon, it is proper, at the first moment, to lift the bottle, so that the neck may press against the lower side of the syphon; which both releases the rings of the bottle from the iron projection, and causes the liquor (by the end of the syphon in the trough being pressed against the leather on the wooden frame therein, and thereby closed) to cease running into the bottle,—the neck of the bottle should be thus kept pressed against the lower side of the syphon during the removal of the bottle, which will keep the syphon closed.

The apparatus might be left several minutes with the cock open, without the liquor in the trough running over, but it is advisable not to trust so much to the float closing the valve, but to turn off the cock whenever the apparatus is left, or a cessation in working it occurs.

The following is an ENUMERATION (by the Patentee) of the ADVANTAGES in using the APPARATUS; and from the consideration we have given to its nature, and construction, we think experience will bear him out in the Statement.

Firstly, *A very great saving of time is effected.*—This will be obvious, when it is considered that four bottles are always filling at the same moment, and that they fill as fast as the workman can change them. The apparatus, however, admits of being used at any slower rate of speed. The numerous advantages arising from bottling liquors with such expedition are too obvious to enumerate. But it may be proper to observe that, as the liquor in the cask is always exposed to the action of the atmosphere during the operation of bottling, dispatch must be of importance where the liquor is a delicate wine.

2ndly, *All the bottles (however varying in heighth) fill to one precise point, and then the liquor ceases to run into them, without the least intervention of the workman.*—This, besides the advantage of having all the bottles so uniformly filled, saves time and liquor in corking them; there being no necessity (as in the present mode) to dash any of the liquor out of them.

3rdly, *The liquor in the trough, and consequently the bottles on the syphons, never run over during the operation (though the cock is always open); nor would they for some time afterwards.*

4thly, *The bottles hang on the syphons while filling,*—Consequently the workman is saved the fatigue of holding them; and as they never run over, and he has both hands at liberty, he can examine them better, and more at leisure.

5thly, *There is no ullage liquor.* Each syphon ceases running the moment the bottle is begun to be withdrawn from it, and recommences the moment the full bottle is replaced by the empty one, and these effects are produced by the mere action of changing the bottles; yet the flow from the cask is constant, and nearly equable during the whole operation.

6thly, *A bag of gauze may be fastened to the end of the valve tube to intercept the particles of finings, or yeast, which occasionally pass from the cask during the process of bottling.*—Therefore, in bottling beer it is not necessary to leave so much in the cask; and less risk exists of the bottles being broken by after fermentation.

7thly, *There is no jarring of the bottles against the cock.*—This constantly takes place in the common method, and communicates a continual tremulous motion to the liquor in the cask.

8thly, *The liquor runs into the trough, and thence into the bottles, with so gentle a stream, as not to cause the least frothing, even in the liveliest beer.*—The consequent advantages are, that less air combines with the liquor in the bottles, which, therefore, may be corked immediately with more safety; and, in the case of beer, there is no waste from frothing.

From a consideration of the properties of the apparatus, as enumerated in the four last advantages, it will naturally be concluded that the liquor may be drawn from the cask by the apparatus, at any rate of speed, without being disturbed, or muddied, and experience has proved this conclusion to be correct.

9thly, *The workman can cork the bottles as he takes them from the syphons.*—This is certainly an advantage in bottling very delicate wines, or where one workman only is employed.

10thly, *The most inexperienced may bottle liquors by the apparatus with greater dispatch, less waste, and more precision, than the most skilful can, by the common method.*

WITH RESPECT TO THE CORKING MACHINE.

The principle of this invention is, *to force the cork into the bottle through a conical tube in contact with its mouth, and in such a position as to form one continuous tube with its neck, and having the lower orifice so small as that the cork must be considerably* compressed, *and* compacted, *in passing through it.*

This principle being known, there can be little difficulty in comprehending the construction of the machine from the engraving; but it may be as well to add the following general description, with reference to it:—

The machine is represented in the position in which the different parts appear, when the workman is on the point of impelling a cork into the bottle. The cork is represented in the middle tube, and the bottle under it. There are three tubes, of different diameters, for bottles of different sized necks; the least is small enough for pint bottles.

The cork is forced through the tube by an impeller, acted upon by the power of a lever. The three impellers form part of a cross bar, each end of which is fixed to a perpendicular side rod, which slides against each outer side of the fixed frame, and which side rods are connected with the lever (the latter is represented by the longest projections, the cross piece at their highest ends being its handle). Those side rods are confined by knobs on the frame, so that the lever can communicate to them (and, consequently, to the impelles), a vertical motion alone. The resulting vibratory-motion of the shorter ends of the lever is compensated by two vibrating rods, represented by the two perpendicular rods connecting the upper, with the lower cross rod.

The bottle stands in a trough, for the purpose of saving the liquor, when a starred bottle flies in corking. The tubes are cemented into the tube bar, which forms part of the fixed frame; it was, therefore, necessary to elevate and depress the trough, for the purpose of pressing the bottle against the tube until corked, and afterwards of enabling it to be easily removed. This is effected by means of the treadle: its radiating rod causes (by the motion of the foot) a wedge to traverse on an inclined plane; this wedge (part of which is shewn under the lever) is formed so as to keep its upper surface always horizontal.

Between the trough and the wedge, is a piece of wood, with pins projecting from it on each side of the fixed frame, so as to confine it (and, of course, the trough) to a vertical motion alone. One, two, or three of these pieces of wood are used, according as the bottles are French, wine, porter, or pints. The screws in the tube bar are for the purpose of regulating the degree of protrusion of the impellers through the tubes; the underside of the impeller bar coming in contact with the heads of those screws, when the lever is depressed to its utmost.

The machines are constructed principally of iron, with brass tubes (therefore will stand all climates), are portable; and are likely to remain perfect for years; each may be packed in a case of a foot square, by two and a half feet long.—Price seven guineas.

The Patentee's Directions for using the Machine are as follows.

PLACE the machine close to the bottles, and between you and them, when you are working it—Seat yourself in such a position that your right foot may be on the pedal, and confined by the strap, and the handle of the lever directly under your right shoulder.

Take up a bottle by its neck, with the right hand, and with the forefinger in its mouth.—Having thus ascertained the size of the *nip*, place it (with the same hand) under the proper sized tube, holding it close up to it, and then, raising the right foot, the pedal will cause the trough to rise up to the bottle, and to retain it firmly with its mouth against the tube. Be particular that the end of the tube is in the mouth of the bottle. Then, *at one and the same moment*, raise the lever with the right hand, as high as it will go, (keeping it there) and take a proper sized cork, with the left hand, from a repository for them placed before you.—Then, after dipping the cork in a cup of the liquor, put it in the tube with the left hand, adjusting it so that the impeller will press exactly upon its centre. Then depress the lever *suddenly;* keeping, at this moment, the right foot pressing up the trough, so as to prevent its giving way by the pressure of the cork in entering the bottle.—When the lever is depressed to its utmost, press the right foot downwards, which will lower the trough, then take hold of the bottle with the left hand, and raise the lever about an inch or two, and depress it again, when the bottle will be disengaged. Then, *at one and the same moment*, put the corked bottle down, with the left hand, and take up another uncorked bottle with the right hand, and repeat the operation.

If, on depressing the lever, much resistance should be found, it is a proof, either that the cork is too large for the bottle, or is of bad quality, and you should not persevere in corking the bottle with it, there being danger of bursting its neck. In this case, always, after removing the bottle from the trough, force the cork through the tube. It will not be injured for a larger bottle.

In choosing the corks, it should be borne in mind, that as they are not *crushed*, (by which they are elongated, and their diameters, as well as their expansive force, diminished) but merely *compressed*, and that as they are compressed at the moment of entering the bottles, both on the tops and sides, and consequently *compacted*, and their expansive force increased) corks of less diameter than would be chosen in corking by the common method ought to be selected, or the bottles would be corked tighter than is desirable.

Corks may be used which have merely been dipped in a cup of the liquor the moment of being used, but it is highly recommended to scald them in water, or steam, or boil them for about five minutes, at any time before using them, as they are thereby rendered more elastic,—their fibres are softened,—no mark remains on them,—and they enter the bottles more freely,—it also cleanses them. They should never be forced through the tubes without being previously wet, for the purpose of diminishing the friction in the tubes.

If the corks were previously sorted into two or three sizes, it would much accelerate the work.

The Patentee enumerates the following ADVANTAGES as attendant on the USE of the MACHINE; and, from our having inspected it in operation, we think, that though it may appear he has been anxious not to omit any, yet that he has not over-rated them.

1stly, *More than half the time is saved.*—This advantage is gained, principally, from the compression of the cork, and the impelling it into the bottle being effected by *one operation, or motion of the lever.* Twelve bottles have been corked in one minute, as an experiment, and thirty dozen in an hour; but one workman could, during the whole of the usual working hours, cork, with ease, at the rate of upwards of twenty-five dozen per hour; and if the corks were previously sorted into two or three sizes, (which is recommended) considerably more time would be saved. Time would also be saved by combining in operation, with this machine, the bottling apparatus, as it fills the

bottles with such precision, that there is no necessity to dash any of the liquor out of them, or even to look how they are filled.

2ndly, *The bottles are corked more uniformly.*—This must be evident, from the impellers always protruding the same length through the tubes.

3rdly, *The bottles may be corked so as to have the heads of the corks even within the mouths of the bottles, or at any required distance above.*—This is effected by merely turning the screws in the tube bar, which regulate the degree of protrusion of the impellers through the tubes.—Shorter corks may therefore be used, and be as efficient as the common ones, by which one third of their cost would be saved.

4thly, *The bottles are better corked.*—This arises partly from the corks being *compressed and compacted,* (whereby the expansive force of the fibres is rather increased than injured) instead of being *crushed,* or *broken,* as in the common methods; and partly from the corks, *at the moment of entering the bottles,* being subjected to a pressure both on their tops and sides, which causes them to become firmer and closer in the bottles, than when driven in after having been crushed by any of the common methods. Another advantage from their not being crushed is, that no dust from them can fall into the bottle, (which will happen when they are crushed either by the teeth, or by a crushing machine) they being as perfect when drawn from the bottles as before they entered them. The corks may be passed through the tubes with their heads downwards, if preferred, or cylindrical corks may be used. The power of the lever enables the bottles to be so tightly corked as to render the wiring of porter bottles totally unnecessary.

5thly, *No bottles need be broken by corking them.*—The breakage is avoided by their being merely held up to the tubes, the bar of which is firmly fixed; therefore there can be no jarring against the bottles. Starred bottles, however, will break in the corking, as in the common method; but this is to be desired, in order to save the liquor.

6thly, *All temptation to crush the corks by biting them, is avoided.*—The removal of the temptation to continue this filthy practice is certainly not a trifling desideratum, when it is considered that from its being a quicker method than crushing them by any of the present machines for that purpose, it is very frequently resorted to when the workmen are paid by the number corked.

7thly, *An hour's practice will enable any person to cork with the machine, more expeditiously—more uniformly—and with less breakage of bottles, than the most skilful could do, by the common method.*

London Mechanics' Institution,

WEDNESDAY, 10th of MAY, 1826.

MR. WALLIS'S SIXTH LECTURE ON ASTRONOMY.

VARIOUS ASTRONOMICAL SYSTEMS. GENERAL VIEW OF THE SOLAR SYSTEM. PHENOMENA OF THE PLANETS. SATURN'S RINGS. ECLIPSES AND TRANSITS OF THE SATELLITES OF JUPITER. COMETS. FIXED STARS. NEBULÆ. CONCLUSION.

On Wednesday last Mr. Wallis delivered his sixth and concluding lecture of his excellent course on Astronomy.

He commenced by observing, that as he was appearing before them for the last time, he would take this opportunity of thanking them for the attention he had received, which, he trusted, had been beneficial to them, and which had certainly been highly pleasureable to him.

In the present lecture he should regard the numerous heavenly bodies as connected together in the form of a system. No doubt astronomy must have occupied the attention of man from the earliest period of his existence. From history it was collected, that this was the first science cultivated, and it was of the greatest antiquity. As it was observed the celestial bodies shifted their situation in reference to each other, they were divided into two classes, —fixed and wandering stars.

The *Ptolemaic* system, which supposed the earth the centre of the universe, round which all the heavenly bodies revolved diurnally from east to west, was the most ancient, with the exception of that of Pythagoras, who referred the apparent revolution of the heavens to the rotation of the earth, which he considered revolved round the sun. The system of this Grecian philosopher was the same in principle with that of Nicholas Copernicus. It was observed by the ancients that the planets had the appearance of being *direct, stationary,* and *retrograde;* and it was not until after frequent observations that this was accounted for, by supposing the earth herself in motion. He should proceed to show, mechanically, that the *direct, stationary,* and *retrograde* appearance of the planets can only be so explained: and it was to be recollected, that

according to every argument which the laws of mechanics afford, the earth could not be the centre of the planetary system. If, however, that the earth is herself in motion were at all doubtful, the *aberration* of light which had been explained in a former lecture, would be sufficient to establish the fact. The system, then, of Ptolemy, the Egyptian, and of Tycho Brahe, had been set aside by the beautiful simplicity of the *Copernican* system, which he had before said was founded on the principles laid down by *Pythagoras*. He attributed the motion of the comets to the sun, as their general centre of revolution.

Amongst other systems that had given way to the Pythagorean was that of *Des Cartes*. This individual established a system of *vortices*. He imagined the sun to be placed in the centre of a vast whirlpool of subtle matter, which extends to the utmost limits of the system. The planets being plunged into such parts of this vortex as are equal in density with themselves, are, by its constant circulation, dragged along with it, and carried round their several orbits. Those planets which have satellites form *vortices* of their own, and the satellites are whirled round them on the same principle that they are driven round the sun. Mr. Wallis observed that this system was insufficient, for if there were no counteracting power the planets must fly off from the vortex. To explain this Mr. Wallis introduced an apparatus which exhibited two glass tubes, containing matter of different densities. They being put into motion described a vortex, when it was shown, that the matter flew off from the centre in the order of their density, the most dense running up to the farthest end of the tube. Mr. Wallis observed that this was a system which involved the greatest confusion, for each planet must form a separate vortex, to account for the motion of its satellites.

All had, however, given way to the system of Copernicus which, as far as could be ascertained from history, was identical with that of Pythagoras.

Mr. Wallis then exhibited a transparency representing the sun, the planet Venus, and the earth. His object was to explain the direct, stationary, and retrograde appearances of the planets. The two planets were placed at their relative distances, and described their orbits as in nature : after being in conjunction, they moved in their orbits with different degrees of velocity but both moved from east to west. At two periods they were in the same line, and as they were both moving the same way, the planet as seen from the earth would of course appear *stationary*. At another period, as the velocity of the earth was greater than that of Venus, when the former had passed the line of the latter, Venus would appear to *retrograde*. Her *direct* motion was shewn to be the result of her real and apparent path being in the same direction.

Mr. Wallis then exhibited a transparency of Mercury, the nearest planet to the sun. He revolves round the sun in 87 of our days. He was seldom visible on account of his proximity to the sun, and generally rose a little before or a little after that luminary. His diameter appeared three times as great when in the crescent form as when a full orb. He was believed to revolve on his own axis : but his nearness to the sun had prevented any spots being seen on his surface by which this could be determined. This opinion was partly or in a degree supported by an appearance something like twilight being observed every 24 hours on the tips of his crescent. His diameter was not quite 4000 miles ; and his distance from the sun was 37,000,000 miles.

The next planet is Venus, which is called an inferior planet, because, like Mercury, it moves in an orbit within that of the earth. Venus was nearly of the same magnitude as the earth, and completed her revolution on her axis in about the same period. She is involved in a dense atmosphere, and spots are seen on her surface, but as these may be in the atmosphere her revolution cannot be exactly determined from them. Her axis inclines to the plane of her orbit considerably, and she must be subject, therefore, to great and sudden changes of season. Neither Venus nor Mercury appear to have satellites ; if they had, the satellites would be seen as spots on the sun's disc : for they frequently travel over that luminary. A transparency of Venus was here exhibited. The rugged edge of the terminator of the crescent indicated the irregularity of her surface. There was a black spot on the lower limb which seemed to detach a portion from the rest of the planet : this

was thought to be the shadow of a mountain. She was 68,000,000 miles from the sun. Her extreme brilliancy made her appear the largest of the planets.

The next transparency was one of Mars. He was 145,000,000 miles from the sun, and went round it in 21 years. His axis inclines 30° to the plane of his orbit. Singular spots are seen on his surface, and there are some at the Poles protruding and varying at different periods in their brightness. They were thought to be great masses of snow and ice by Herschel, who observed they diminished or decreased according as the sun's rays are on them. Mr. Wallis then referred to the different colours of the planets, to show their different atmospheres. Venus gave a beautiful blue light; Mercury looked purple; Mars ruddy; Jupiter's light was a green yellow; and Saturn's a reddish brown.

Within the last 20 years small bodies, called *asteroids*, had been discovered between Mars and Jupiter, which present one of the most curious anomalies knowu to astronomical science. They are very small; are 236,000,000 miles from the sun; and they intersect the planes of their orbits.

Mr. Wallis then referred to Jupiter, the largest planet in the system. A transparency was exhibited, showing the remarkable belts on his surface, parallel to his equator, and his four satellites. The streaks are thought to be the result of the velocity of his rotation on his axis. His distance from the sun is 490,000,000 miles. His diameter is 84,000 miles: and his diurnal revolution is completed in 9 hours and 56 minutes. Mr. Wallis then showed in the most beautiful manner, the *transits*, *immersions*, and *emersions* of the satellites, and explained their operation in discovering the longitude. The different time of the *immersion* is taken at different places, and this shows the degree in which an individual may be. The transit was a beautiful exhibition. The satellite from being bright, like Jupiter, is not seen passing over this planet's disc: but its shadow described a small dark spot, and a few seconds after the shadow was lost on his disc the satellite was again seen pursuing its course as bright as before.

Saturn was next exhibited with his spendid ring and seven satellites. The face of this planet showed belts like Jupiter, which were supposed to be clouds or other matter, so arranged by this planet's immense velocity of revolution. His axis is inclined to the plane of his orbit in an angle of 300. The ring was supposed to be solid matter, and is divided into two concentric rings at a great distance from each other. The narrow edge of the ring is seen at some periods, and it then appears to cross the planet. It is more luminous than Saturn, and its utility is apparent in no other way than by supposing that it may concentrate heat from the sun's rays. The exterior diameter of Saturn's ring is 204,000 miles. Its thickness is less than the diameter of its satellites. They both shine by reflected light; for they mutually cast shadows on each other. The interval between Saturn and his first ring is 35,000 miles. The breadth of the first ring is 20,000; the interval between the rings is 2,900; and the breadth of the outer ring is 7,200 miles.

Till 1781 Saturn was thought the most distant planet in the System; but Herschel since then discovered *Georgium Sidus*. In consequence of its immense distance, little was known of this planet. It has six satellites, which revolve round it almost perpendicular to the ecliptic. The Georgian planet is 1800,000,000 miles from the sun, which it revolves round in 84 years. It subtends an angle of only 4′. His diameter is about 35,000 miles.

Mr. Wallis then referred to the comets, and exhibited a beautiful transparency of the comet of 1811. He described comets as eccentric in their orbits; and supposed them to be of an electrical nature. They were not solid matter, for, excepting at the head or *nucleus*, stars were seen through them. A splendid transparency was then exhibited, with a comet at its *aphelion*, or greatest distance from the sun. It moved towards the sun with an increased velocity till it reached its *perihelion*, or least distance; it then proceeded with a slow motion till it completed its orbit. It was shewn that its *nucleus* was always towards the sun.

Mr. Wallis then referred to the fixed stars, which shine by their own light. They are found in clusters, which we call *nebulæ*. Herschel discovered 2,500 not known before. What was called the *Milky-way* is one of these nebulæ. We see 80,000,000 fixed stars; but the amount may be much

greater, there being light in the heavens supposed to be occasioned by stars which the most powerful telescopes have not yet been able to describe. Light from the nearest fixed stars, notwithstanding the immense velocity with which it travels, would be two years reaching the earth. Mr. Wallis, contemplating these wonders of nature, was led to conclude in a strain of eloquence of the highest possible order. We wish our limits would allow us to do him justice: but though his sentiments would add grace to our pages, we must leave room for matter more essentially mechanical.

The science of astronomy was calculated to elevate the mind into its sublimest moods; to impose religious veneration. When we viewed ourselves as individuals in relation to the millions that have existence, and when we looked at the whole human race, and considered how diminutive, what a nonentity it was, compared with the universe; when we "Looked through nature up to nature's God," and saw the beautiful harmony pervading the great whole; when we contemplated this, could we view it as the emanation of chance? No!

"These are thy glorious works, Parent of good,
Almighty! Thine this universal frame,
Thus wondrous fair: Thyself how wondrous then,
Unspeakable! Who sitt'st above these heavens
To us invisible, or dimly seen
In these thy lowest works: yet these declare
Thy goodness beyond thought, and power divine.
Speak, ye who best can tell, ye sons of light,
Angels; for ye behold him, and with songs
And choral symphonies, day without night,
Circle his throne rejoicing; ye in heaven,
On earth join all ye creatures to extol
Him first, him last, him midst, and without end."

Mr. Wallis delivered these lines most impressively. He bowed and retired. The cheers were deafening.

Mr. Mac William then announced as follows:—

A Course of Lectures on *Mechanics* will be delivered, on the Fridays after the conclusion of Mr. Wallis's Course, by Mr. Toplis, a member of your Committee. He will commence on Friday, the 19th May.

A Course of Lectures will also be delivered, on Geology and Mineralogy, by Mr. Ogg, to commence on Wednesday, the 24th May.

On Wednesday next there will be no Lecture, in consequence of Mr. Ogg's arrangements not being quite complete.

TO OUR READERS AND CORRESPONDENTS.

[*Our Subscribers are respectfully informed, that our 73rd. Number (which will be the commencement of the fourth volume) will contain, in addition to the usual variety of interesting matter, an index and title page to the third volume, now completed; it will also be accompanied by an elegant engraved frontispiece on steel, representing a perspective view of the London Mechanics' Institution, &c. Part 18, including the index, title page, and frontispiece, will appear at the same time, May 20th.*

H. W. had better employ asbestus, as the granulated metal will be acted upon by the liquid.

R. P——T must excuse our taking upon ourselves the criticism he proposes: the Register is open to whatever remarks he may have to make on the subject.

A Subscriber will meet with what he enquires about in our next.

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